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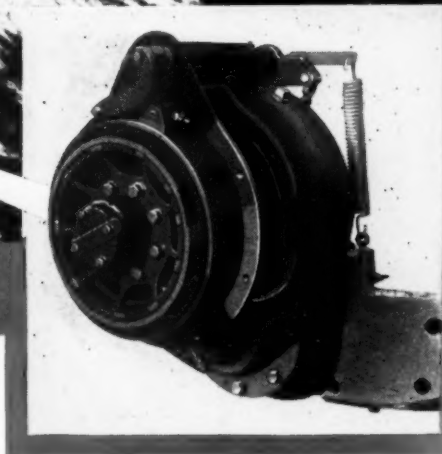


Timken Bearing Equipped Baker Bulldozer Control Unit mounted on Allis-Chalmers Tractor engaged in highway construction in California. Made by The Baker Manufacturing Company, Springfield, Ill.

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It takes accuracy to produce accuracy and strength to produce strength. That's why, throughout the construction industry, in all kinds of equipment, so many manufacturers use Timken Bearings and so many contractors want them in their machines.

Make sure you have them — and look for the trade-mark "TIMKEN" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

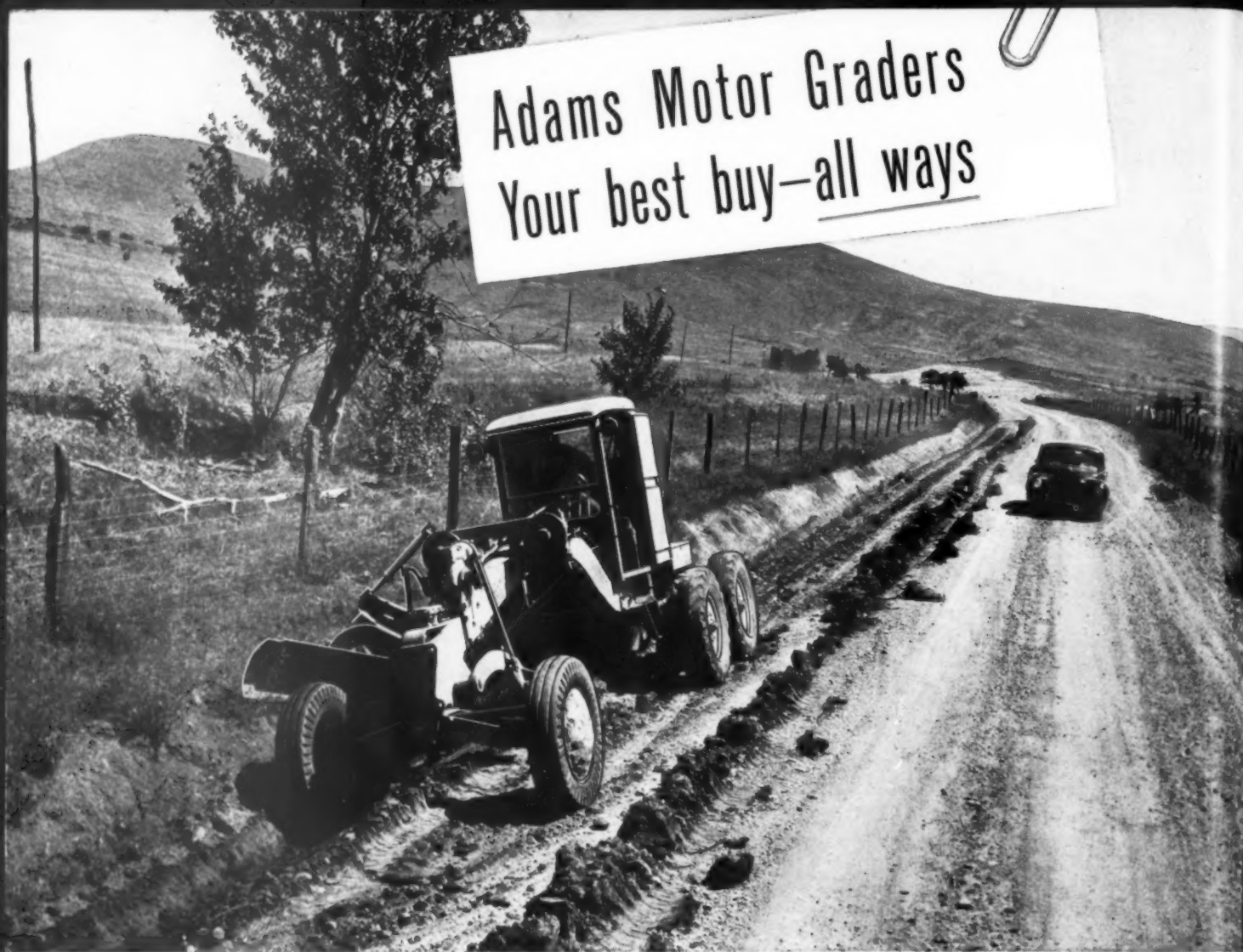


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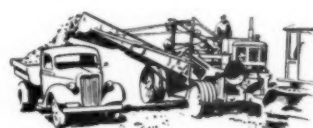
You'll find the reason for this unfailing, economical dependability in the way Adams Motor Graders are designed and built. You'll find it in their powerful,

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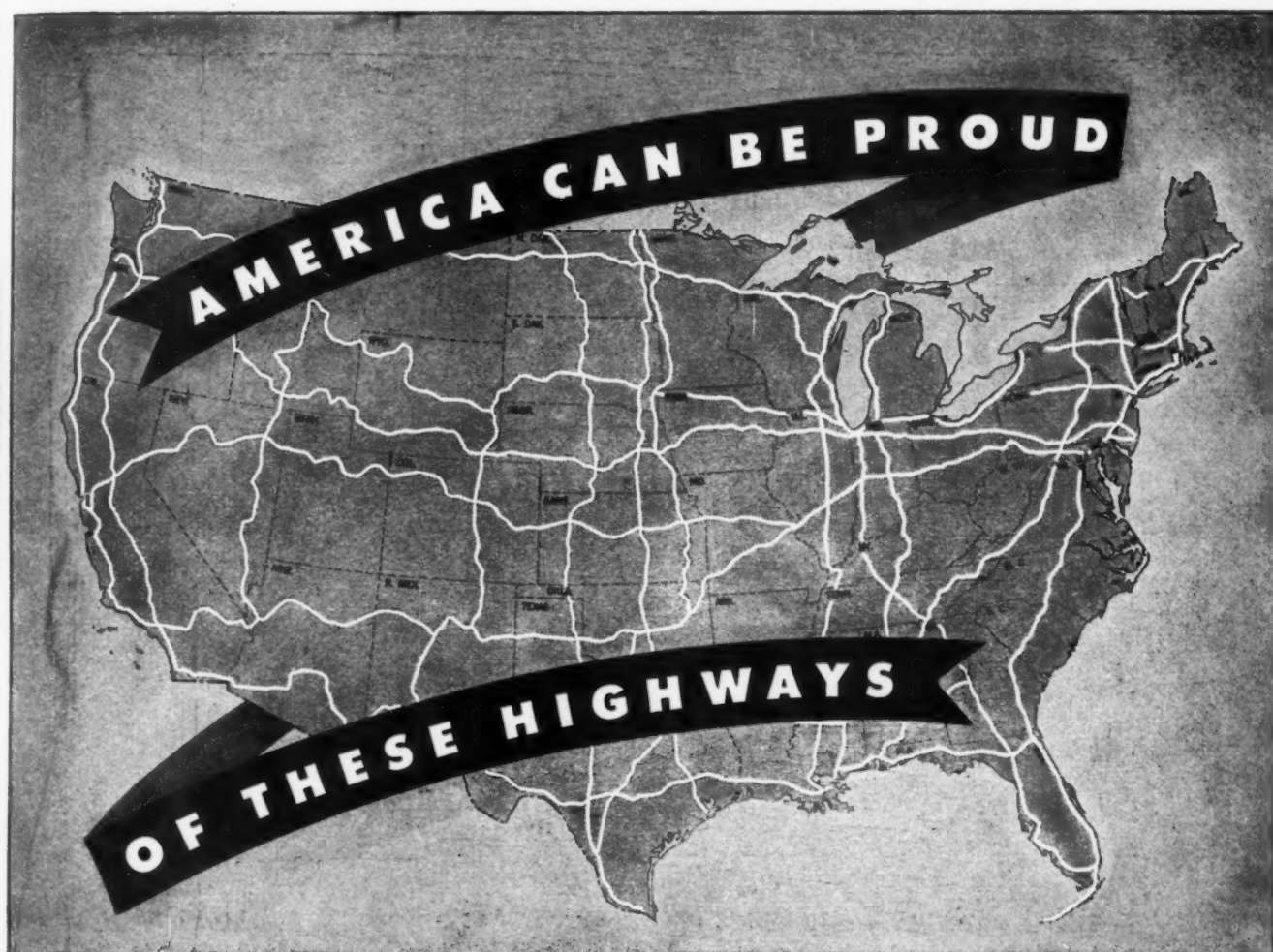
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Shown on the map above are a few of the principal highways of the great U. S. highway network, now 31 years old and begun with passage by Congress of the Federal-Aid Road Act in 1916. And it's just 21 years since U. S. highways have been uniformly marked, with north-south routes given odd numbers from 1 to 101, and east-west routes even numbers from 2 to 90. U. S. feeder routes have higher numbers with final digits referring to the main roads they serve.

There's a lot of history and romance in our highways, many of them following old wagon trails of pioneer days. What tourist, planning a long motor trip, hasn't thrilled to vistas opened up by U. S. 1 ... U. S. 11 ... U. S. 41 ... U. S. 2 ... U. S. 30 ... U. S. 40 ... ribboning away for hundreds of miles, up and down and across the land? And what businessman or salesman, travel-

ing long distances by automobile, hasn't been conscious of the benefits afforded by Federal highways?

By supplying contractors with the steel products needed for modern concrete roads and for bridges of all types, Bethlehem has had a part in the building of many of the important links in our national highway system. Today, with so many highways to be repaired or relocated, and new bridges built, Bethlehem again offers well-rounded service and a line of road steels designed and built for top-notch performance. If you have a highway job coming up in the near future, we suggest you get in touch with the nearest Bethlehem district office.

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STEEL FOR HIGHWAYS

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With Roads and Streets Have Been Combined
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In This Issue

Coming Articles

Houston Expressways

Special ROADS AND STREETS presentation of design and construction methods being employed in this city's progressive large-scale program. Includes details of "enclosed membrane" subgrade and embankment design to utilize poor soil; under-reamed footings and other phases of viaduct construction; other features of wide interest.

Is It a Fair Bid?

How the Arkansas highway department independently estimates unit costs for engineers' estimates

Lime Stabilization for Poor Subgrades

Summary of methods and experiences with lime in the bad clays around Austin, Texas

Repairing a Bascule Bridge

An old lift bridge at Toledo gets new track plates—how it was done

16-arch Corrugated Culvert

Interesting small bridge design, as seen on Sunset Highway in Oregon

Airfield for Small Planes

How emulsion job was designed and built for eastern airport, as told by the consulting engineer

Steam Cleaning

Cuts Repair Costs

Arkansas county road garage puts in modern pressure cleaning equipment and keeps tab on overhaul costs to show actual savings

How to Combine Two Soils

Graphic methods of proportioning two unsatisfactory soils to get one good soil for subgrades and subbases

Contractors at Work

Continuing these pictorial job visits

Job and Equipment Ideas

More kinks and tricks that save money for contractors and maintenance crews

Other timely "know how" and "how do" stuff of the kind that is making things hum in this 2-billion-dollar road, street and airfield construction year

HAROLD J. MCKEEVER, Editor

C. T. MURRAY, Managing Editor

H. K. GLIDDEN, Contributing Editor

V. J. BROWN, Consulting Editor

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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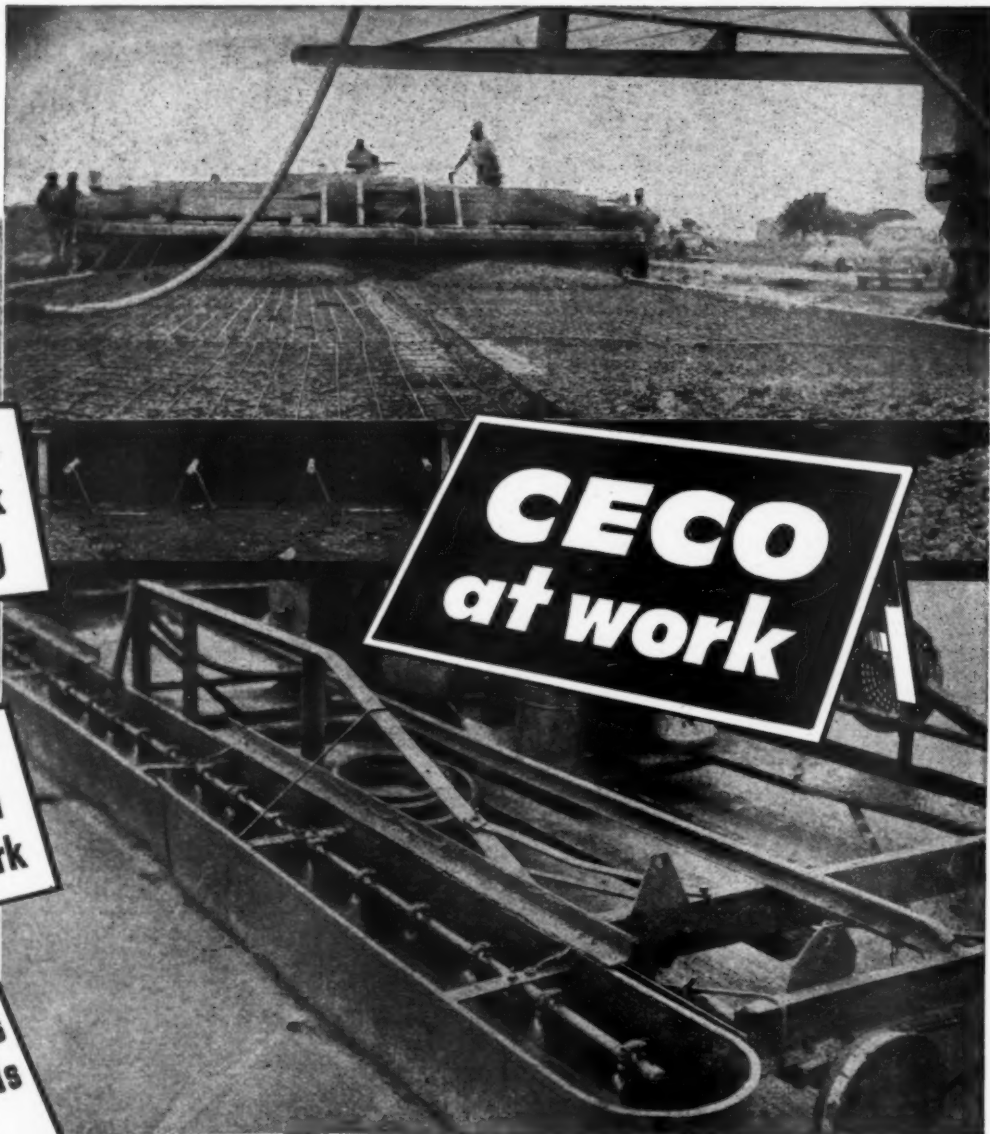
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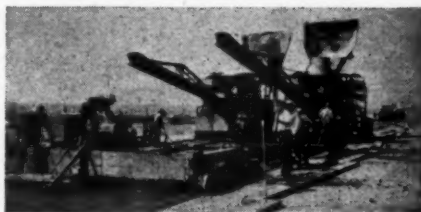
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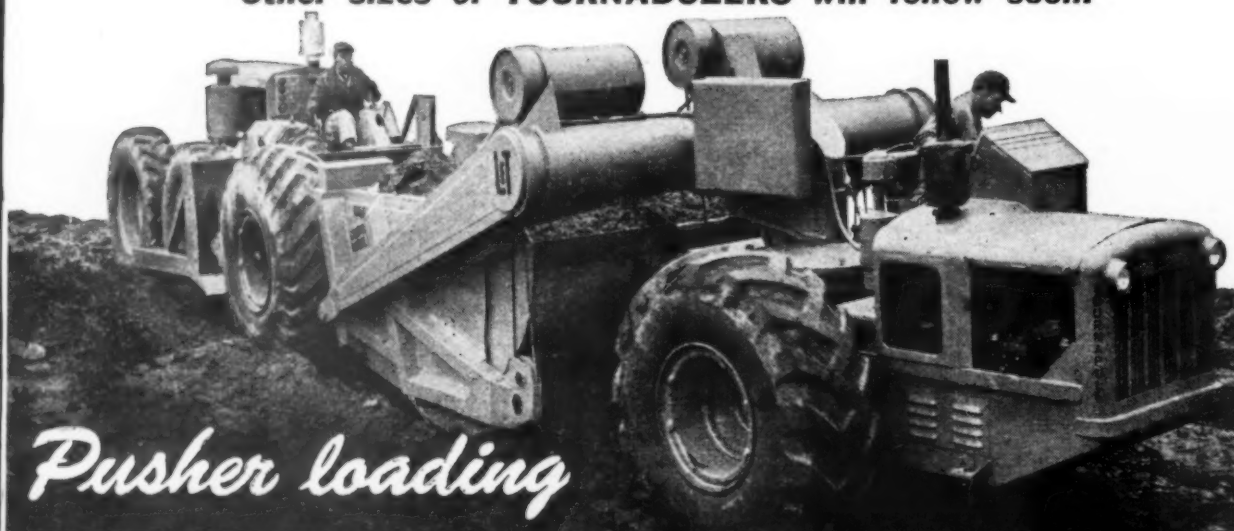
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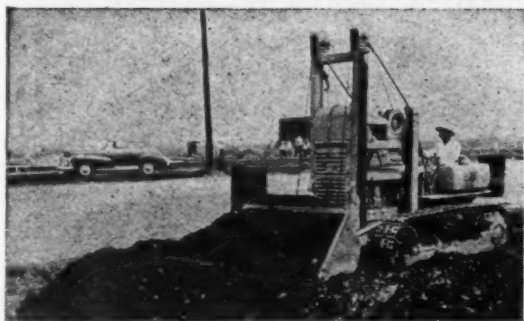
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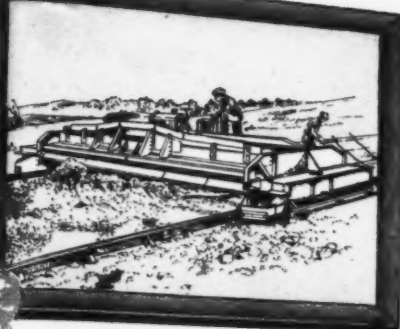
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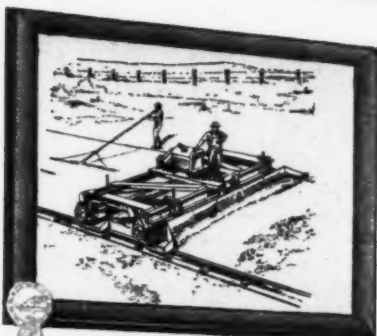
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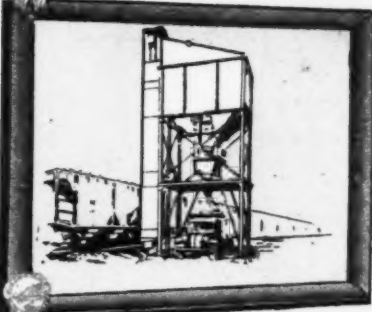
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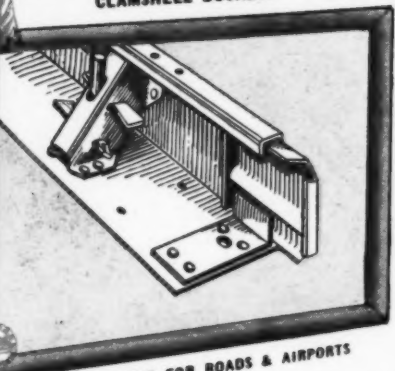
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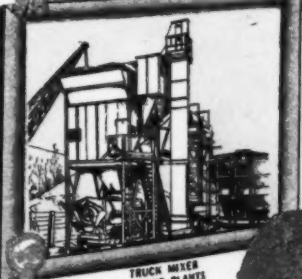
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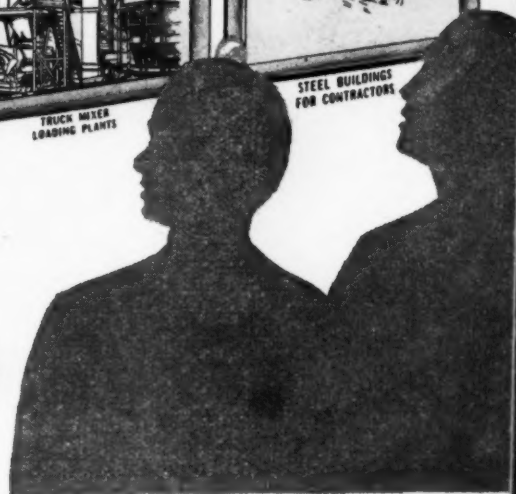


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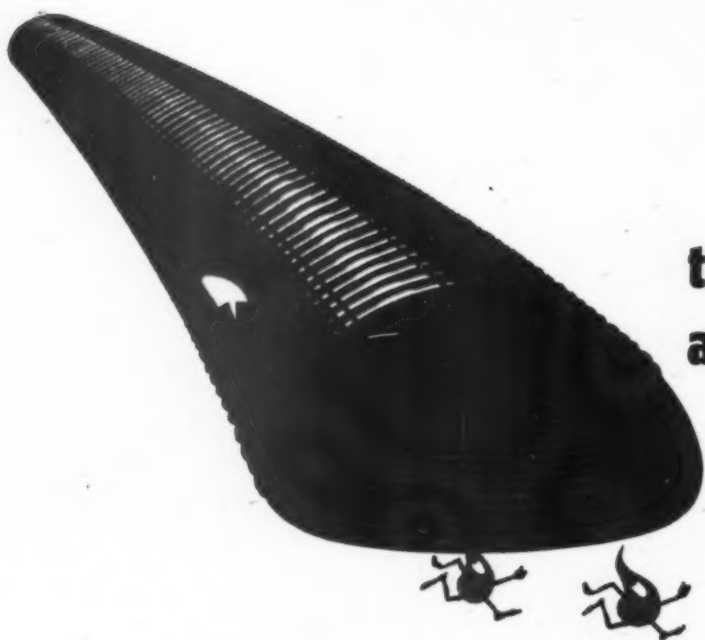
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Water doesn't hang around long when an ARMCO Pipe-Arch is on the job. That's because the greatest effective waterway area is in the bottom—right where it is needed for fast, unrestricted runoff.

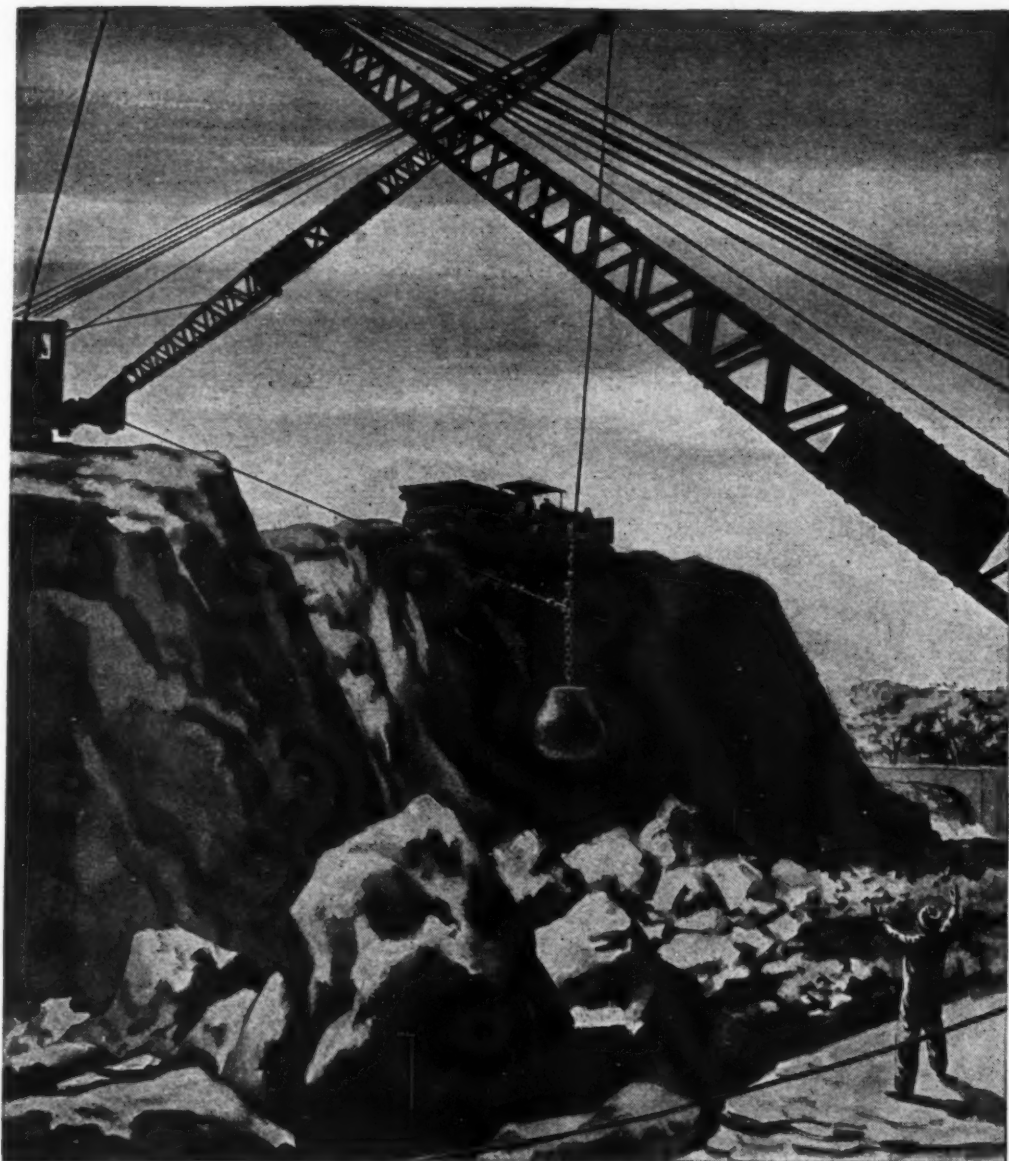
You'll also find that ARMCO Pipe-Arches are the safe, practical answer to problems of limited headroom. They have ample strength under shallow cover to withstand the impact and vibration of heavy traffic. Costs are low because you get adequate drainage without raising the grade or installing several smaller openings. And with Pipe-Arch there is less excavation. The wide bottom "fits the ditch"—provides more bearing area for added safety on soft ground.

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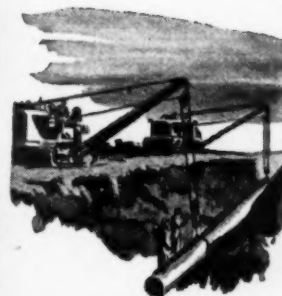
Once you use ARMCO Pipe-Arch you'll be convinced. These sturdy structures have all the advantages of full-round corrugated pipe plus a functional design that meets specific drainage requirements. Write for complete information. Armco Drainage & Metal Products, Inc., 2195 Curtis Street, Middletown, Ohio. Offices in principal cities.



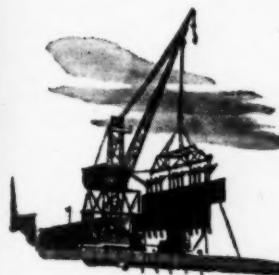
ARMCO PIPE-ARCHES



You'll see more and more jobs like these as the nation's new highway and airport building program gets under way. Skull-crackers and drag-lines use a lot of Preformed wire rope to get the material out.



Laying pipe lines is a fast job today with machines and Preformed wire rope. Improved methods and improved wire rope make the work easier and faster.



Do you worry when you see great weights lifted by shipyard cranes? The operators don't, for they know the Preformed wire rope will hold.

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Wire Rope Makes it Possible



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ASK YOUR OWN WIRE ROPE MANUFACTURER OR DISTRIBUTOR

HANDLES EASIER - LASTS LONGER

TO BEAT YOUR ESTIMATE WHEN THE GOING GETS TOUGH



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It spreads over a wider area with every swing, eliminating hand shoveling . . . Boom can be elevated to 9-ft.

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Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.

BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB



ABOVE—Laying a four-inch course of No. 1 rock with an Adnun. Rock passes 4-inch screen, retained on 2-inch ... An extra, profitable job for any Adnun!



ABOVE—Putting down base course for another smooth, Adnun-laid highway. Only Adnun has Continuous Course Correction feature for smoothing subgrade irregularities out of succeeding courses. Note retractable wheels for fast, easy between-jobs travel.

ADNUN Black Top Paver ability goes far beyond precision laying of all types of black-top mixes at big volume rates. With an Adnun you can add extra job possibilities that mean more machine time on profitable work for you: Laying stone, slag or gravel courses . . . Laying soil cement and all types of built-up subgrade material.

In action, on any of these materials, Adnun hydraulic controls of all main paver functions, four-wheel-drive, power cutoff, and powerful six-cylinder engine make it easy for one man to get real paving results on a high output basis.

Adnun's rugged, cross-braced construction is made to take the pounding of heavy trucks for years of low-cost operation and maintenance. For the complete Adnun story, call your Adnun Representative, or write direct for illustrated Adnun Bulletin.

THE FOOTE CO., INC.

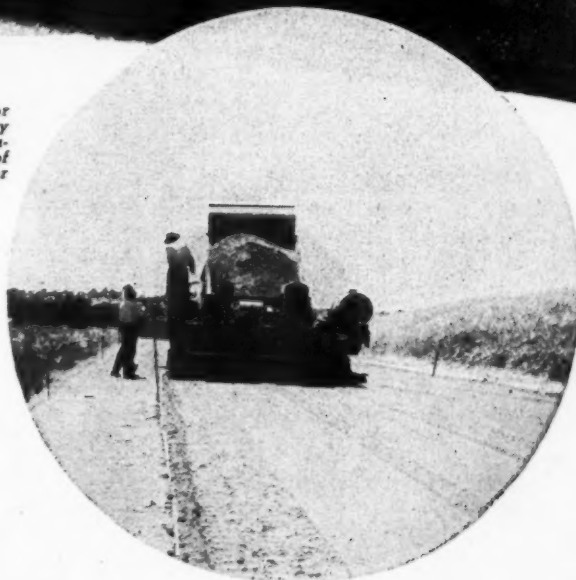
1936 State Street Nunda, New York

BUILDERS OF FOOTE KINETIC MIXERS, MULTIFOOTE CONCRETE PAVERS, AND ADNUN BLACK TOP PAVERS

SEE PAGE 102

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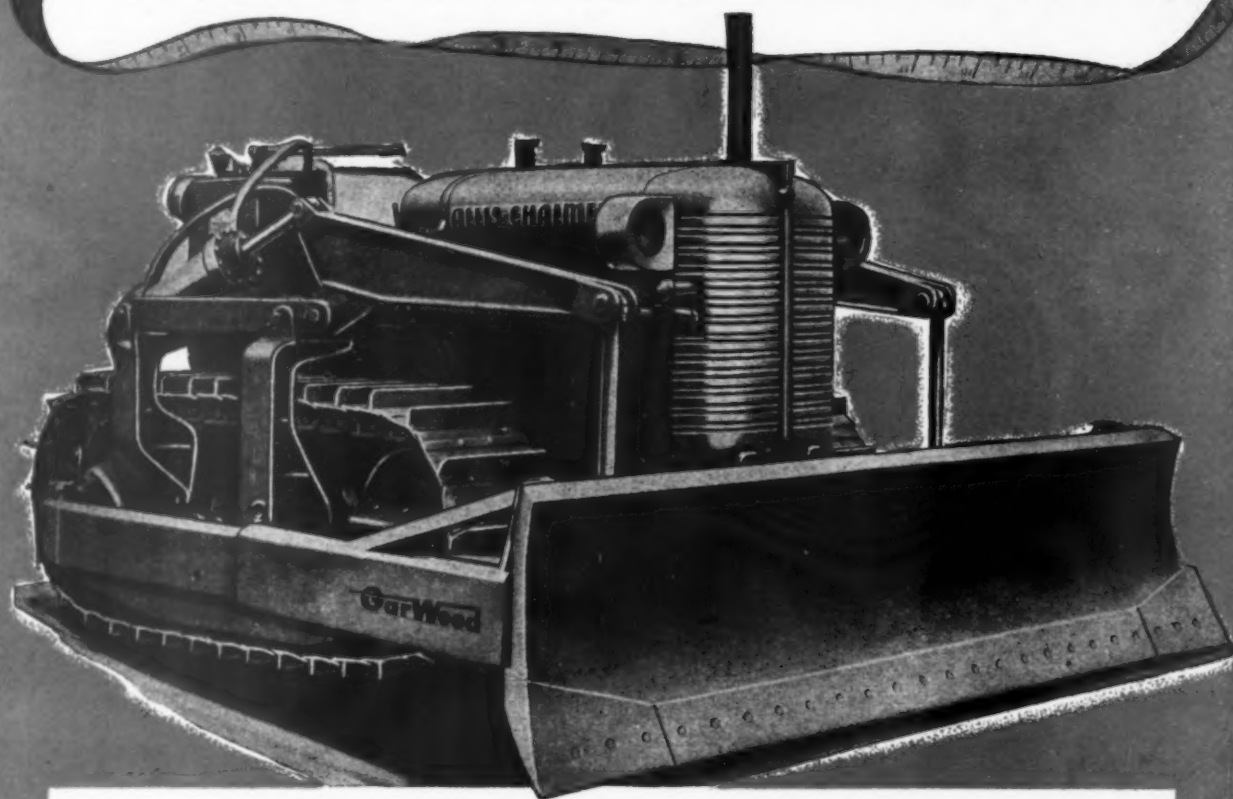
Only **ADNUN**
BLACK TOP PAVERS
give you these
Extra **Job**
possibilities!



IN CIRCLE—Laying a 10-inch course of subgrade aggregate to finished surface accuracy. A fast Adnun operation that makes finishing easier; completed roads smoother, longer-lasting.

ADNUN
TRADE MARK REGISTERED
BLACK TOP PAYER

Measure the Difference



Performance against performance... just measure the difference... and see for yourself just HOW FAR AHEAD OF THE FIELD GAR WOOD ROAD MACHINERY REALLY IS.

Owners all over the world and the men who operate them will tell you the same story every time. Gar Wood is ahead by miles. In mining, quarrying, lumbering, railroading

and general contracting GAR WOOD ROAD MACHINERY means dependability, rugged strength, less down time, precision engineering, practical operating costs — all factors that put Gar Wood far out in front of the field.

Gar Wood Dozers, Dozecastors, Rippers, two and four wheel Scrapers are sold and serviced by Allis Chalmers Dealers everywhere.

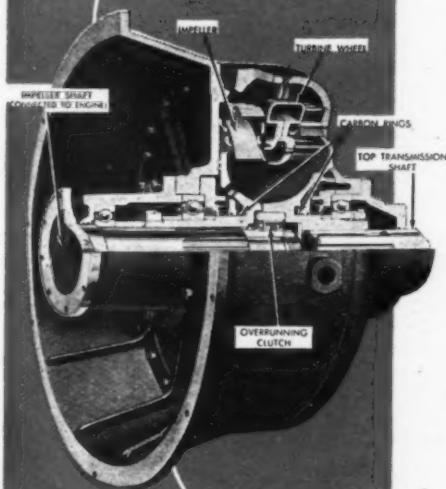


GAR WOOD INDUSTRIES, INC.
ROAD MACHINERY DIVISION
WAYNE, MICHIGAN

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TORQUE CONVERTER TRACTORS

WHAT THE MEN WHO OWN THEM SAY:



Cross-section view of
Torque Converter

MIDWEST OWNERS

Tried, tested, proved! First Torque Converter Tractor led to purchase of seven additional units. More on order.

S. A. Healy Co., Chicago, Illinois

"Have 12,000 hours on our Torque Converter Tractor and it is still in good condition. Has moved many thousands of yards of dirt with minimum repair cost."

De Ruyter Brothers, Willmar, Minn.

"Less shifting feature is appreciated by operator. Steering clutches last longer. Tractor requires less servicing because shock is absorbed."

John Dehner, Fort Wayne, Indiana

"Ability to constantly increase motor power without 'clutching' cannot help but reduce to no small extent, the wear and tear on transmission and drive."

Schuermann Building & Realty Co.,
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EASTERN OWNER

"Moves 20 percent more yardage, yet upkeep cost is about half that of conventional tractors."

Mills, Gorman and McAllister,
Wendell, West Virginia

WESTERN OWNERS

"Not interested in any tractor that does not have Torque Converter."

John Iben, Phoenix, Arizona

"Easier and smoother operation. Less breakage of either pulled or pushed machinery or cable. Use two units—pull scrapers, land planes and rippers, clearing and leveling desert land."

Hanson Farms, Casa Grande, Arizona

SOUTHWEST OWNERS

"Torque Converter Tractor is finest bulldozer tractor ever built. We also use a Torque Converter Tractor with a scraper and haul more dirt faster and cheaper because of time saved shifting gears. Low upkeep on tractors and auxiliary equipment."

Olene Hansen, Houston, Texas

"Never had a tractor which moves dirt as quickly and cheaply as a Torque Converter. Got 3,000 hours on my first one and no trouble yet. Now own three."

Storms Construction Co.,
Pampa, Texas

NORTHWEST OWNER

"Get one-third more production and smoother performance than with conventional tractor. Less operator fatigue."

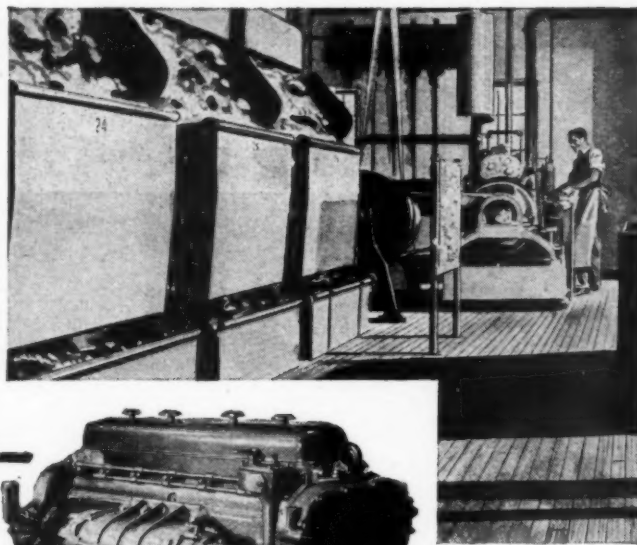
Wirkkala Bros., Naselle, Wash.

Like these users, you can lower cost, step up yardage moved with Allis-Chalmers Torque Converter Tractors. Here is "get up and go" performance with less gear-shifting. Operation is continuously smooth—starting, pushing, pulling. This all adds up to more work done, less maintenance, **MORE PROFIT!** Now is the time to investigate.



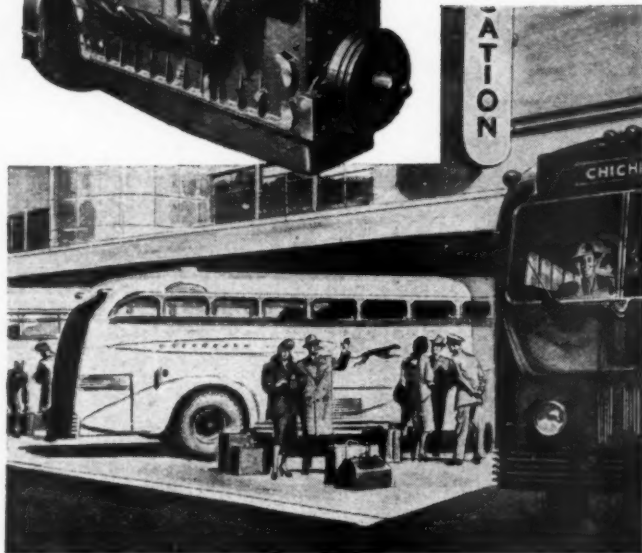
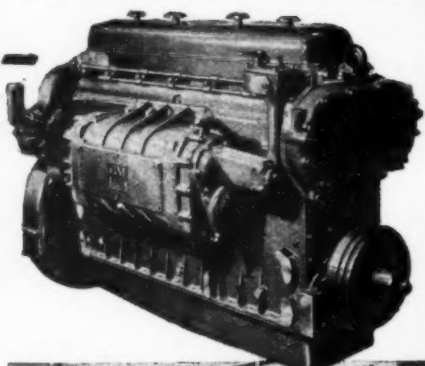
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TRACTOR DIVISION • MILWAUKEE 1, U. S. A.



Name the Job —

*GM Diesel
will do it*



because — there's power at every downstroke

MAYBE you've thought a Diesel engine had to have a lot of room. Perhaps you figured you couldn't take advantage of all the savings in fuel, dependability and other features of Diesel power because of limited space.

But that isn't so. For the General Motors Diesel packs all the good dependable Diesel power you've heard about into an engine that's compact and moderate in weight.

It is done by getting power at every downstroke. 2-cycle design means that each piston works all the time instead of half the time. You get twice as many power strokes for each turn of the shaft.

This explains not only the compactness and lower weight of the GM Diesel but also its quick acceleration, its ability to pick up a load fast, its quick starting and its clean exhaust.

It explains why this engine is making Diesel power available where it couldn't be used before—and why it's bringing new convenience and economy to lumbering, fishing, ginning, drilling and all the other industries where sturdy, safe, dependable power is needed.

Whatever your need for power might be, it will pay you well to investigate General Motors Diesel engines.

DETROIT DIESEL ENGINE DIVISION

DETROIT 23, MICH. • { SINGLE ENGINES . . . Up to 200 H.P.
MULTIPLE UNITS . . . Up to 800 H.P.

GENERAL MOTORS



**DIESEL BRAWN
WITHOUT THE
BULK**

EFFICIENCY BRIGADE

"Caterpillar" builds the units you need to zone equipment for lowest costs on earth



1 Track-type tractors for "push"-distance earthmoving.



2 Track-type tractors for loading and pulling scrapers on medium hauls.



3 Wheel-type tractors for high-speed long hauls.—plus motor graders for finishing work.

HERE'S a typical example of matched equipment zoned to the job—the ideal way to go sailing through an operation with minimum lost motion and maximum time and money saving. It's a traffic bypass project (Los Angeles) to which Peter Kiewit Sons Co. (one of America's largest contractors) assigned a brigade of equipment that included two sizes of "Caterpillar" Diesel Tractors, a "Caterpillar" Diesel No. 12 Motor Grader—with scrapers, bulldozers and tampers to fit their power and controls.

Other important "accessories" you don't see—but no doubt know about—are proved "Caterpillar" quality, dependability and operating economy . . . plus dealer service that is widely regarded as the most complete, efficient and best equipped of its kind.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS



CATERPILLAR DIESEL

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT
—for lowest costs on earth



DYNAMICS



The new Diamond-equipped, gravel crushing, screening and washing plant of King Brothers, Dayton, Ohio.

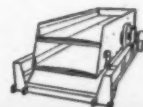
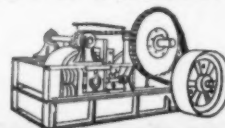
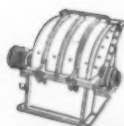


The Diamond Portable ROTOR-LIFT Plant, readily adaptable—in various sizes—to fully portable and semiportable installations.

in action

• • • Producing crushed gravel economically at or near the site of a job is one of the tough problems construction engineers have to lick. That's where the *portability* of the Diamond Rotor-Lift gravel crushing and screening plant can save time and cut haulage costs. Here in a completely *portable* plant, is all equipment needed to process gravel from its raw state to the exact size needed for the job . . . and as close to the job site as possible! Learn how Diamond Dynamics can work for you. Call your Diamond dealer today!

"THERE'S NOTHING TOUGHER THAN A DIAMOND"



DIAMOND IRON WORKS, INC.
AND THE MAHR MANUFACTURING COMPANY DIVISION

MINNEAPOLIS 11, MINNESOTA

The DIAMOND line of Rock and Gravel Crushing and Handling Equipment:

Portable Crushing and Screening Plants
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Grizzlies
Portable Screening and Washing Plants

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Vibrating Screens

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Drag Washers
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Bins—Hoppers

Euclids SPEED CONSTRUCTION

of New
Toronto-Barrie
Highway



Tapered chute construction and high dumping angle mean quick, clean shedding of the load — an important advantage of Rear-Dump Euclids.

● Construction of the new controlled-access highway between Toronto and Barrie, Ontario, involves moving 7,500,000 cu. yds. of earth. Prominent among the equipment being used on the several contracts are Rear-Dump and Bottom-Dump Euclids.

On one of their contracts Peacock and McQuigge, Ltd. used power shovels for excavation and 15-ton Rear-Dump Euclids for hauling. The Euclids moved clay and gravel from highway cuts for fill at other locations. These contractors also speeded earth moving with a Euclid Loader which delivered 12 bank yds. into Bottom-Dump Euclids in an average of 48 seconds loading time.

On another section Angus & Taylor, Ltd. used 13-yd. Bottom-Dump Euclids, loaded by shovel and elevating grader, to move material on hauls of about one-half mile from cut to fill.

Rear-Dump and Bottom-Dump Euclids combine minimum vehicle weight with maximum strength and capacity. They are built to move pay dirt faster and at lower cost on off-the-highway hauls.

Your Euclid distributor or representative will be glad to provide helpful information for your requirements.



The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO



Gulf Quality Lubricants and Fuels

help contractor keep ahead of schedule
on water supply project !



Intercounty Construction Corp., Hyattsville, Md., has the contract to lay a 30-inch cast iron water line from High Bridge, Pa., to Lebanon, Pa., a distance of 20 miles. The line is being laid over rough terrain, and at points the trench is 16 feet deep.

"ALL-WEATHER PROTECTION with Gulf lubricants and the fine performance of Gulf fuels are playing a big part in our rapid progress on this job," says M. F. DiNova, Superintendent of Intercounty Construction Corp. "In spite of day-to-day changes in service conditions, our equipment is operating efficiently, and we have steered clear of delays caused by mechanical troubles."

On all types of construction projects, Gulf quality lubricants and motor fuels are helping

contractors to a speedier, more profitable job. They work as a team to insure top-notch equipment performance, fewer delays, and lower maintenance costs.

Write, wire, or phone your nearest Gulf office today and arrange to use Gulf quality lubricants and fuels on your next job. They are quickly available to you through twelve hundred warehouses located in 30 states from Maine to New Mexico.



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THAT WILL CONVERT YOUR STANDARD ROAD GRADER INTO A FINE GRADING MACHINE

IN 10 MINUTES



Now you can do fine grading with *your* road grader. With the Road Grader Gauge, a superior fine grade is assured throughout your job.

Simple and sturdy, easily attached or removed. Will not interfere with other operations of the grader. Will fine grade to any desired depth. Unexcelled where special stabilization is required.

Now being used on Adams, Allis-Chalmers, Austin Western and Caterpillar standard road graders.

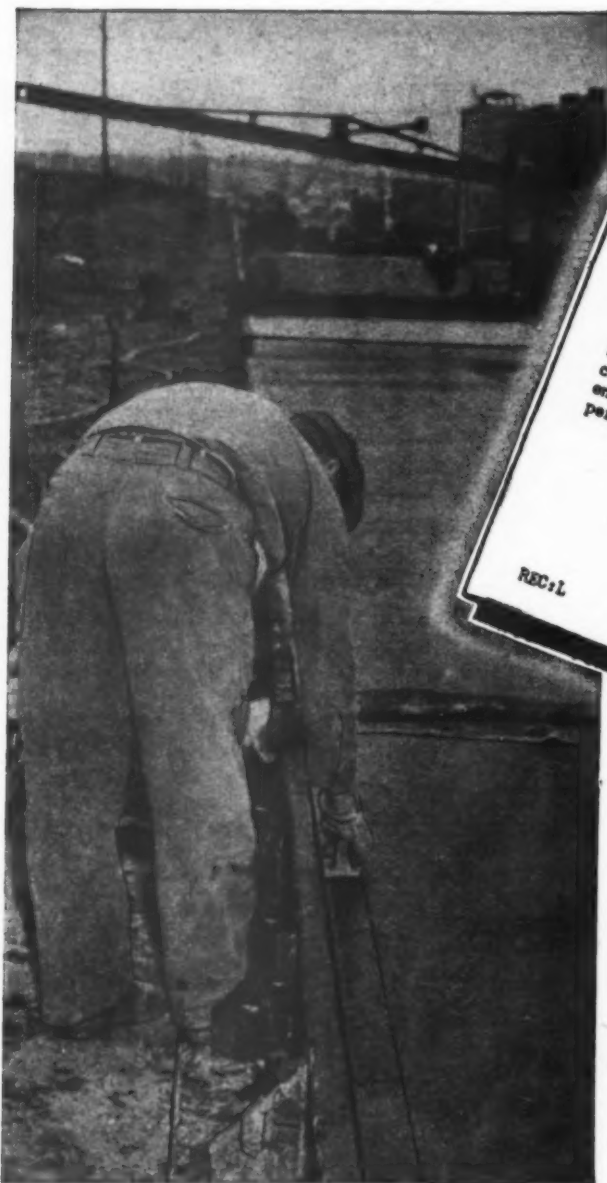
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Patents Pending



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Making better concrete with Duraplastic cement is simple...no added materials...no unusual changes in procedure. The mix is more cohesive and more plastic. It flattens out without segregation...bleeding is minimized.

At no extra cost, Duraplastic provides the proper amount of entrained air by intergrinding with the cement the precise amount of air-entraining material needed for satisfactory field performance.

Send for further information. Write to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

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AIR BUBBLES IN CONCRETE... MAKE IT MORE DURABLE... AND MORE PLASTIC

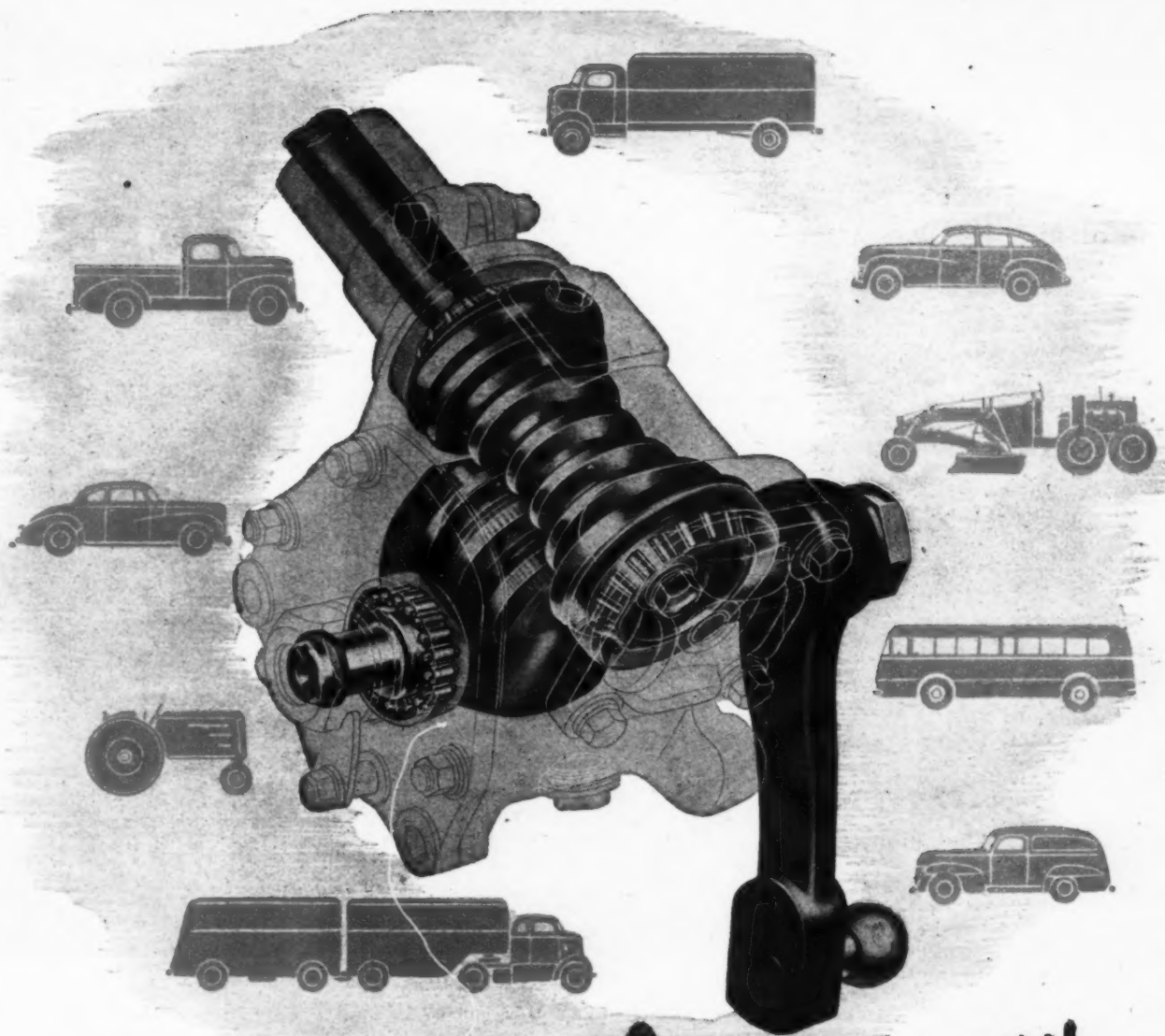
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AIR-ENTRAINING PORTLAND CEMENT

MAKES BETTER CONCRETE AT NO EXTRA COST



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more people steer the *Gemmer way*

Because it is the simplest means to easy steering of buses, trucks, tractors and road machines, Gemmer Steering is found in more types of automotive vehicles and in more of them than any other. Sturdy in its inherent design and fine construction — the Gemmer Steering Gear with reasonable care should last and give satisfaction for the life of the vehicle.

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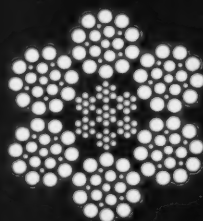
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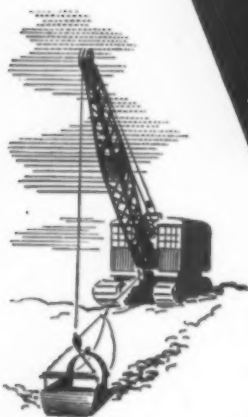
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***Best for flexibility—
and long wear!***



**UPSON-WALTON
6 x 16 FILLER WIRE CABLE**



FOR drag cables on back-fillers and dragline excavators . . . for cargo falls . . . for drag cables on drag scrapers . . . inclined shaft hoists . . . car and slope haulages . . . carry-all scrapers—
wherever you need *BOTH* wear resistance and flexibility to a marked degree, Upson-Walton 6 x 16 Filler Wire Perfection Layrite is the ideal rope for your purpose.

This sturdy cable has *greater abrasion resistance* than

6 x 19 Filler Wire Rope, *greater flexibility* than 6 x 19 Seale. It is more flexible because there are a greater number of wires (21) used in its construction. It is better able to resist abrasion because the outer wires are larger in diameter.

Hemp center or, where operating conditions are very severe, IWRC (independent wire rope center).

Perfection grade—because this finest of all improved plow steels is the strongest, toughest and most resistant to wear of all the grades of wire used to make rope.

Layrite—because this fine *preformed* wire rope results in longer life, greater safety and greater economy.



Established 1871

*Upson-Walton 6 x 37 Perfection Layrite is worth specifying,
and always up to specifications!*

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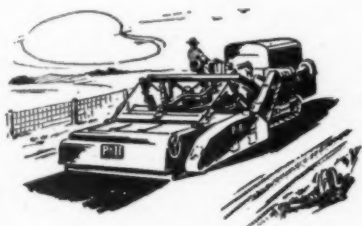


"PAY-DIRT" *in Roads of Native Soils*

Soil Stabilization sets the pace in today's road-building programs with money-saving advantages that come through the use of native, in-place soils.

And the machinery for bringing speed and efficiency to this low cost road building is ready. The new P&H SINGLE PASS STABILIZER has proved its efficiency in fulfilling these 8 basic requirements of processing native soils with any type of admixture:

1. Control processing depth for accurate proportioning
2. Pulverize the soil thoroughly
3. Blend materials uniformly
4. Create a true sub-grade
5. Disperse the liquid through the entire volume in measured quantity
6. Mix the coated material uniformly
7. Lay the completely processed material in a fluffy, even depth, ready for compaction
8. Do all these things in one pass—at a good rate of speed.



**Soil Cement Stabilization
in Oklahoma**

Soils, ranging from sandy loam to light clay, were treated with 10% and 11% cement to a depth of 7 inches. Average processing speed—1067 square yards per hour. 24-foot roadway completed in three 8-foot passes. Maximum length of roadway completed per day—.75 miles. Time: 10 hours.

A typical example of P&H performance is given in caption at left. Contractors and Highway Departments planning the construction of base courses, light traffic roads, streets, airport runways, etc., may obtain complete details by writing us.

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That's just one of the many advantages you get. And so does the motoring public you serve. Other advantages that only asphalt resurfacing gives include: Speed in laying the job — the economy of using local aggregates and local labor — all-weather, easily maintained surface.

Before you invest in road rebuilding, investigate asphalt. It may help you make your highway dollars go farther. When planning



new construction, resurfacing, or widening of streets and highways, get the help of the Standard Oil Asphalt Representative in your locality.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

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- *It Rides on Rubber*
- *It Has 1001 Uses!*

Fast, versatile industrial crane with plenty of LIFT ability . . . ideal for moving castings, steel, scrap, coal, lumber or even machine tools. Travels anywhere . . . on paved surfaces, cinders or just plain mud . . . gets there in a hurry. Available with crane hook, clamshell, or magnet . . . quickly convertible to any other attachment. Operated by ONE man . . . powered by ONE engine . . . controlled from ONE position in cab. Features include: Hydraulic steering . . . Air-actuated hydraulic brakes . . . One piece cast gear case. FULL VISION CAB, pioneered by UNIT, provides 360° visibility for greater safety and efficiency.

5 Ton Capacity . . . 7 Tons with Outriggers

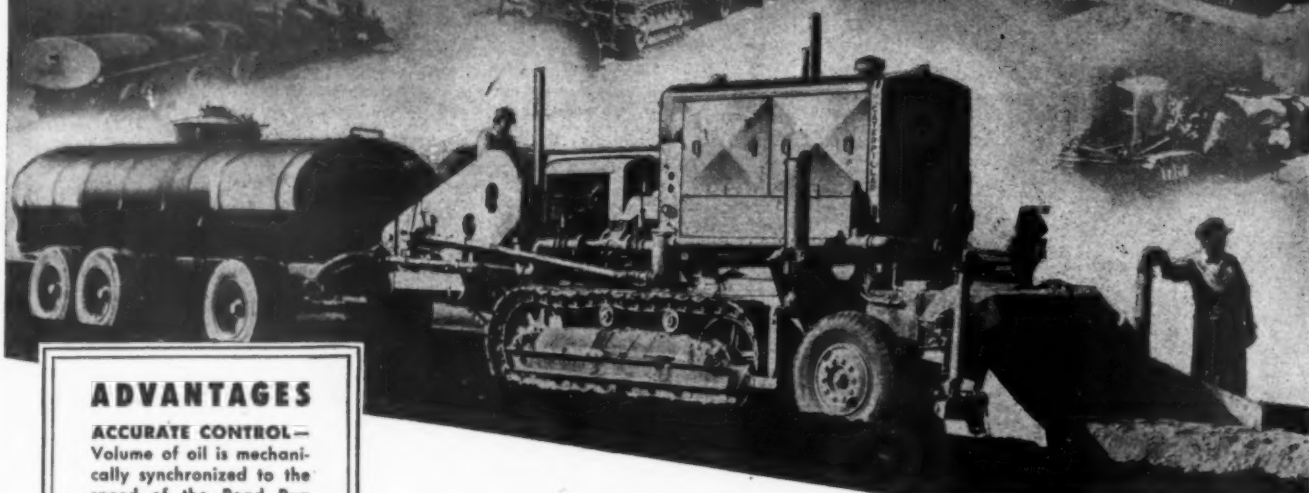
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200 to 550 TONS per hr.
Mixed in a Single Pass!



ADVANTAGES

ACCURATE CONTROL—Volume of oil is mechanically synchronized to the speed of the Road Pug and adjusted to volume of windrow by the Madsen-patented volume metering pump.

A SINGLE UNIT—A complete machine for producing road mix; no elevators or feeders and no extra attachments required except an oil-supply tank trailer.

TWO-MAN OPERATION All necessary operations for producing road mix with a Road Pug are performed by two men.

SINGLE-PASS MIXING Produces a uniform road mix material in a single-pass operation.

MANEUVERABILITY—The Road Pug maneuvers with the ease of a track-type tractor. Hydraulic controls lift the mixer opening to the transporting position and lower it to the working position.

MADSEN ROAD PUG

HERE IS THE ANSWER to low cost road surfacing. A mix-in-travel machine that turns out high quality road mix *faster, better, and at lower cost.*

FASTER because the Madsen Road Pug, a single complete unit, picks up and dry mixes the aggregate...spray injects a *pre-determined amount* of binder...cross mixes the material...and discharges a uniform mixture of dependable quality. **BETTER** because the ratio of aggregate and oil are accurately controlled.

AT LOWER COST because the Madsen Road Pug will produce from 200 to 550 tons per hour, pumping 9000 to 12,000 gallons of road oil while travel-mixing at a speed of 5 to 40 feet per minute. There are no delays because oil tank trucks hitch-on and replenish the oil supply while the Road Pug operates.

LEARN ABOUT the various jobs handled with the Road Pug...see all its outstanding features...write for 12-page illustrated catalogue. Delivery can be made in reasonable time.

MADSEN IRON WORKS

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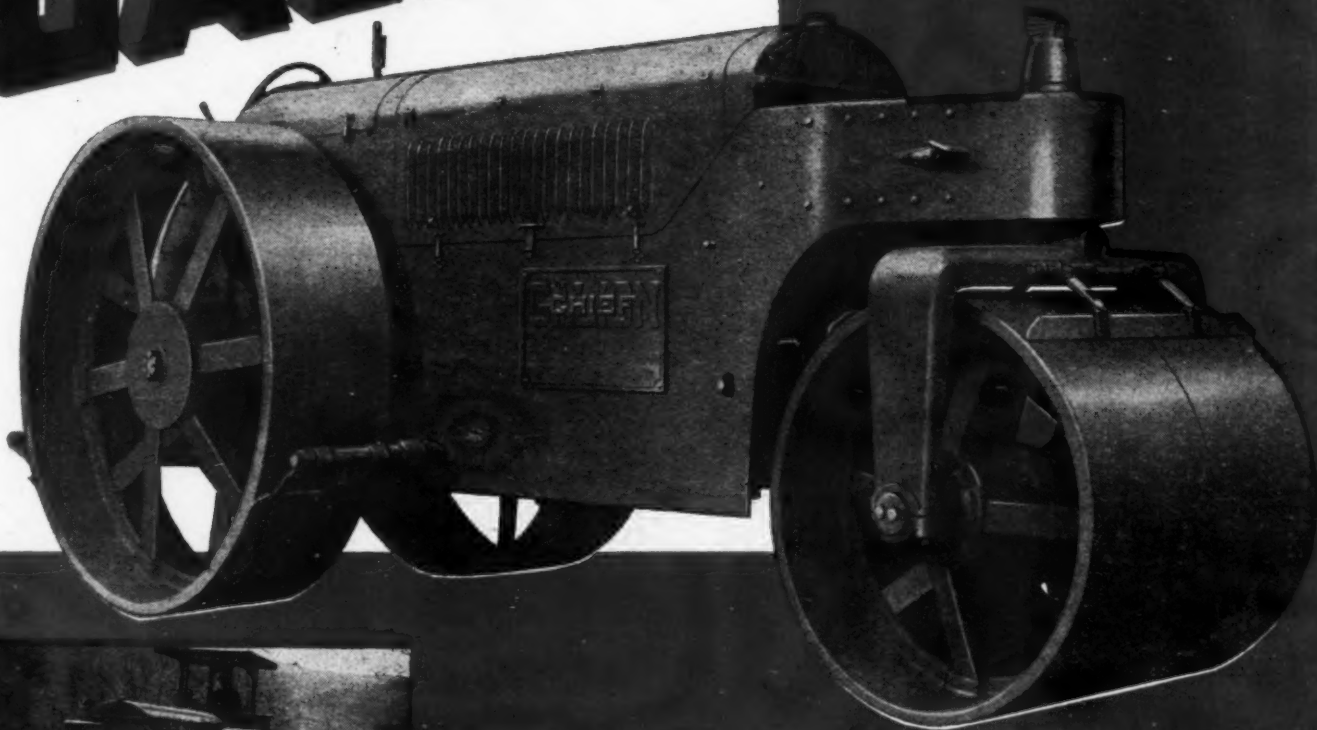


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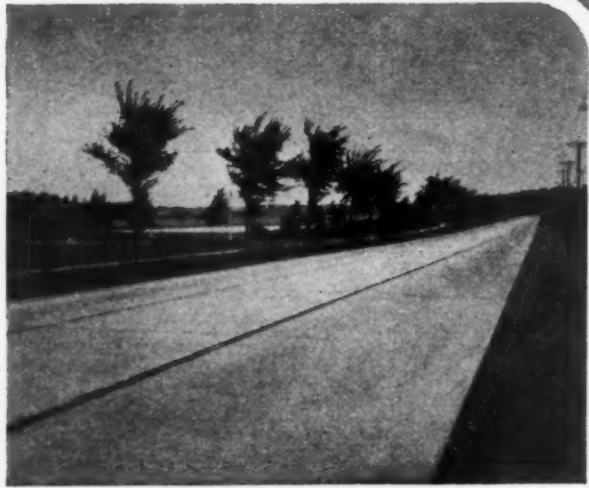
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life, velvet-smooth operation.....
Extra rugged construction throughout.....
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Resistance to slab separation.
 Decrease of spalling and disintegration.

Truscon Welded Steel Fabric and associated Truscon Steel roadbuilding products give adequate protection to public funds invested in highways, and will build greater prestige for you. An experienced Truscon highway engineer will help on any concrete road-building problem you may have.

TRUSCON STEEL COMPANY • YOUNGSTOWN 1, OHIO • Subsidiary of Republic Steel Corporation

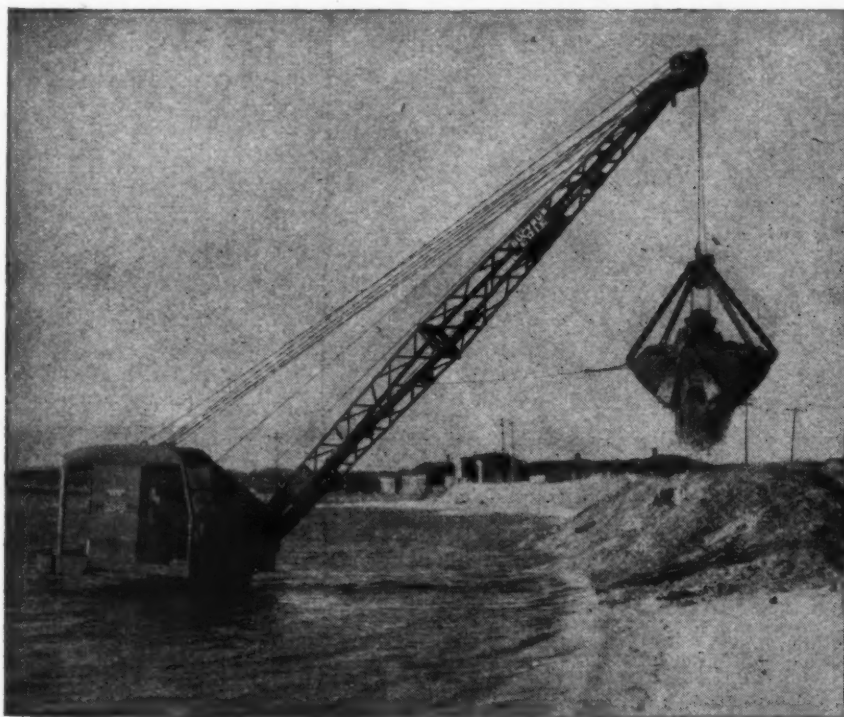
TRUSCON
 WELDED STEEL FABRIC



no *time out* for wet feet

IT'S characteristic of Bucyrus-Erie $\frac{3}{8}$ to $2\frac{1}{2}$ -yard excavators to wade right in and slug it out with the tough jobs—staying in there digging, shift after shift, delivering the high percentage of actual working time that really boosts output.

**YOU ADD EXTRA OUTPUT WITH THE EXTRA
DIGGING TIME BUCYRUS-ERIE GIVE YOU**



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ERIE**

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EVERY HOUR
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BUCYRUS-ERIE

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reasons why

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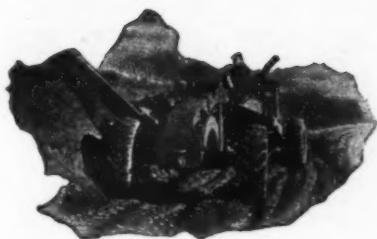
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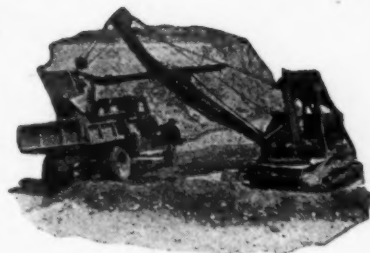
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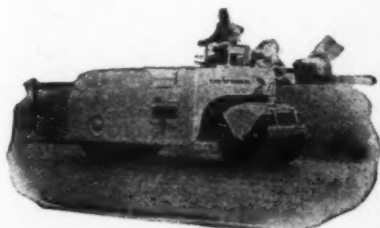
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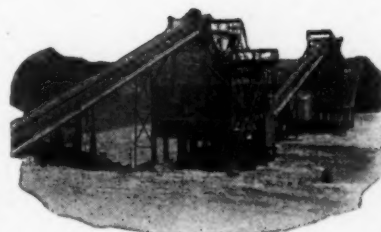
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Offers to purchase all or any part of the above material, f.o.b. location, will be accepted until noon June 25, 1947, by the Regional Office having the inventory. WAA reserves the right to reject any or all offers, to make awards in whole or in part, or to extend the period of the sale. Material is subject to withdrawal prior to contract of sale.

This is a concurrent and continuous sale. 5% of the total inventory will be reserved to fill orders received from Federal Agencies by noon on June 25, 1947. All other orders received by noon on this date will be filled in the following sequence: (a) Certified veterans of World War II, (b) Subsequent priority claimants, (c) Non-priority purchasers.

All orders received after this date will be filled without regard to priorities. Purchaser's order must state thereon: (a) "This order is subject to War Assets Administration Standard Conditions of Sale, and all other advertised terms and conditions, and no other terms or conditions should be binding on War Assets Administration", (b) Type of business and level of trade. Orders from veterans must show certification date, case number and location of certifying office.

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(Sale closes June 25, 1947)

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WAA also has available TNT, electric and non-electric blasting caps.

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Grand Prairie	113,250	613	586	24
Denver	3,031,300	8,000	26,313	—
Los Angeles	2,552,500	19,914	15,158	41
Nashville	2,160,100	18,658	12,262	1
Omaha	148,700	—	—	—
Philadelphia	503,300	10,066	—	—
Salt Lake City	9,163,500	42,270	70,000	—
San Francisco	632,100	88	6,277	—
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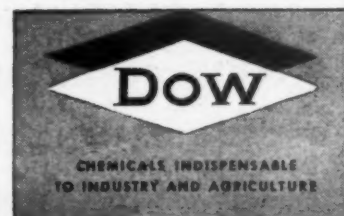
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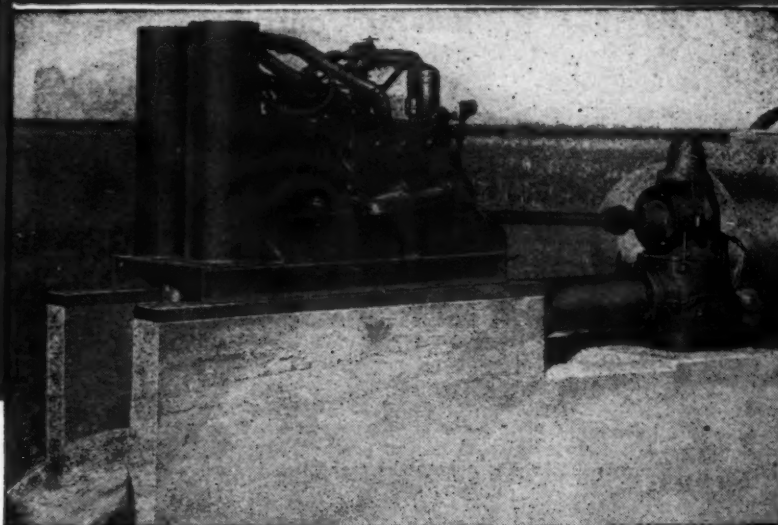
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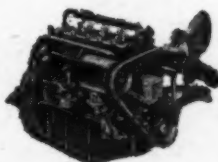
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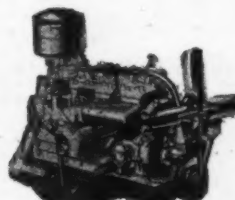
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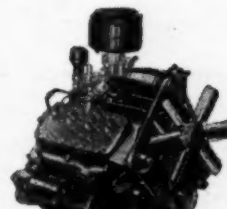
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ROAD AND STREET CONSTRUCTION METHODS AND COSTS

A NEW BOOK OF DATA

By

HALBERT P. GILLETTE and JOHN C. BLACK

FIRST EDITION 1940

This book was planned expressly for use by contractors, engineers and highway officials. It is not a textbook, but a compendium of data, carefully selected with reference to their usability by highway builders and other persons concerned with highway construction costs.

In general the data are of two main classes—dollar and cents costs per mile, per square yard, per cubic yard, and the like, for use in quick approximate estimates; and details of material, labor and equipment costs, with records of man-hours and machine-hours, for use in close estimating and in studies to reduce costs or improve methods.

The data are from a great number of different sources, and are in widely varying detail.

All major articles carry descriptions to show clearly the class of work and the methods for which costs are given, and to provide a basis for further reference and study if desired.

Location and date of job and the source of information are given in the title and introduction to each article.

The grouping of subjects in chapters is convenient, but an unusually complete index is furnished as the main guide to any subject or sub-subject sought.

The authors are both men of practical experience in highway and other construction. Both are members of the American Society of Civil Engineers.

OUTLINE OF CONTENTS

CHAPTER 1. INTRODUCTION—Brief discussions of construction costs, prices, profits and the uses of cost data.

CHAPTER 2. COST INDEXES—Indexes of the U. S. Public Roads Administration and Interstate Commerce Commission, with brief explanations of their construction, uses and limitations.

CHAPTER 3. OVERHEAD COSTS—Separate discussions of the overheads incurred by contractors and by states, counties and cities.

CHAPTER 4. ENGINEERING—Data from states, cities and other sources on the costs of various kinds of surveys and other engineering. There are brief articles on aerial surveys and seismographic soil and rock surveys.

CHAPTER 5. RIGHT-OF-WAY—A general discussion followed by records of actual experience and costs.

CHAPTER 6. EQUIPMENT—This chapter contains several rental and ownership expense schedules in full detail, followed by articles on operating and maintenance costs, including records of fuels, lubricants, etc., a mathematical analysis of the problems of selecting and retiring machines, and a table of depreciation rates.

CHAPTER 7. LABOR—Schedules of established minimum wage scales and records of wage rates in various states; comparisons of contract work and day labor; convict labor costs and other pertinent matter.

CHAPTER 8. CLEARING AND GRUBBING—Records of clearing with tractor-mounted equipment, hand and horse methods, stump blasting, etc.

CHAPTER 9. GRADING—Eighty-four pages of articles on grading with power shovels, scrapers of various types and sizes, elevators, blade graders, bulldozers, etc.; hydraulic grading; rock drilling and blasting; winter grading; special swamp grading; minor operations and hand work.

CHAPTER 10. HAULING AND HANDLING MATERIALS—Studies of hauling operations on power shovel jobs, concrete construction and bituminous construction; truck movements at yards; industrial railways; team and wagon hauling; and other articles.

CHAPTER 11. PRODUCTION OF AGGREGATES—Articles on labor requirements and costs of producing sand, gravel and crushed stone at various locations.

CHAPTER 12. UNTREATED BASES AND SURFACES—Waterbound macadam, crushed rock and gravel construction.

CHAPTER 13. STABILIZATION OF BASES AND SURFACES—This chapter is devoted chiefly to work with calcium chloride, articles on portland cement and bituminous stabilization being given in the chapters on concrete and bituminous construction.

CHAPTER 14. BITUMINOUS SURFACES AND BASES—The five parts of this long chapter contain articles on various methods in different states: Part 1. Surface Treatments; Part 2. Bituminous Macadam; Part 3. Mixed-in-Place Construction; Part 4. Traveling Plant Construction; Part 5. Stationary Plant Construction.

CHAPTER 15. CONCRETE SURFACES AND BASES—Contains numerous detailed records of construction. There are articles on work with 27-E pavers, 34-E pavers, tandem set-ups, batching, hauling, curing, joints, cement-bound macadam, soil-cement roads, stabilization, and other subjects.

CHAPTER 16. BRICK PAVEMENTS—Records of brick pavement construction from various cities and states, including an article on vibrated monolithic. Short reference to granite block.

CHAPTER 17. SIDEWALKS, CURBS AND GUTTERS—Miscellaneous prices and details of construction.

CHAPTER 18. WALLS, FENCES AND GUARD RAILS—A brief chapter of data on these items of highway construction.

CHAPTER 19. BRIDGES AND CULVERTS—Cost data on a large number of steel, concrete and timber bridges and grade separations—also culverts of various types. There are two articles on pump installations for underpass drainage.

CHAPTER 20. TUNNEL CONSTRUCTION—Detailed descriptions and data on the construction of 27 highway tunnels in the West.

CHAPTER 21. GRASS, SHRUBS AND TREES—Several articles on plantings for landscape improvement and protection.

CHAPTER 22. MISCELLANEOUS—Data on pedestrian underpasses, street car loading platforms, truck weighing stations, catch basins and manholes, lignin binder, water pumping, signs and markers, traffic striping, parking meters, highway lighting, radio communication with snow plows, accident prevention, and weather and construction.

INDEX—Unusually complete; arranged for quick reference and maximum convenience.

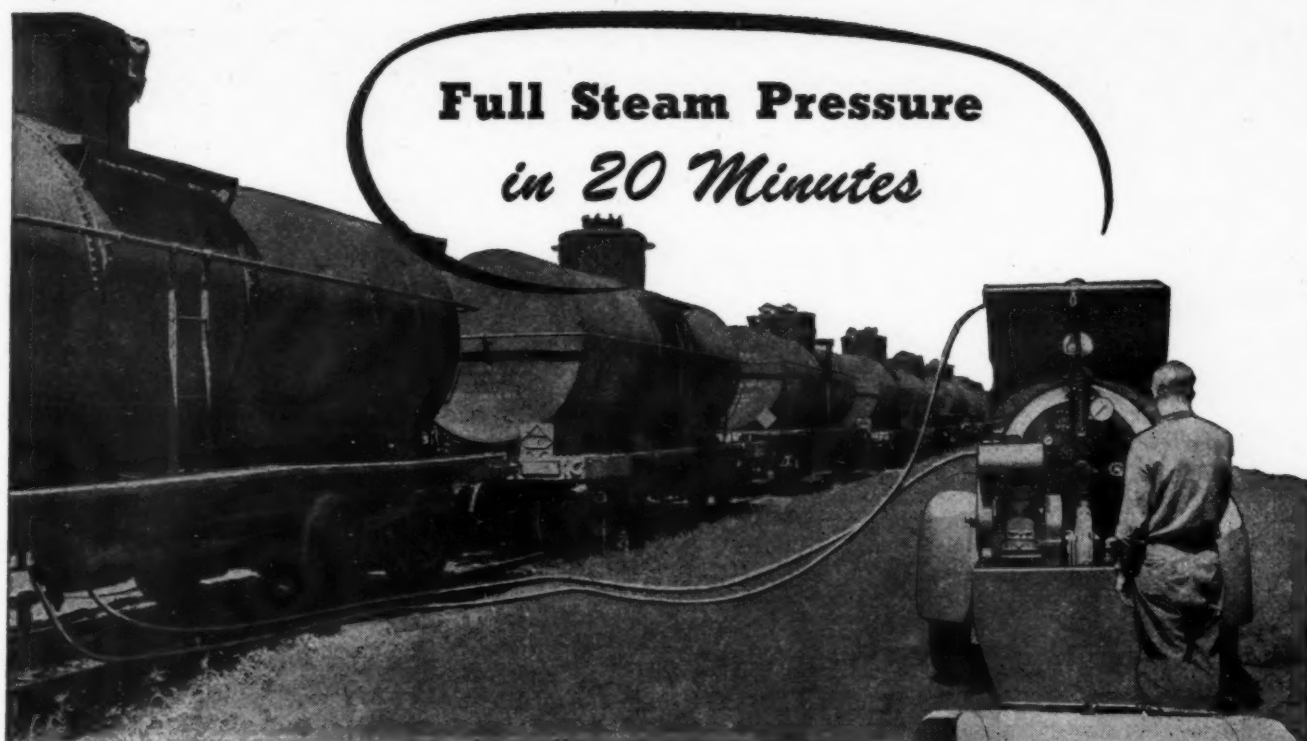
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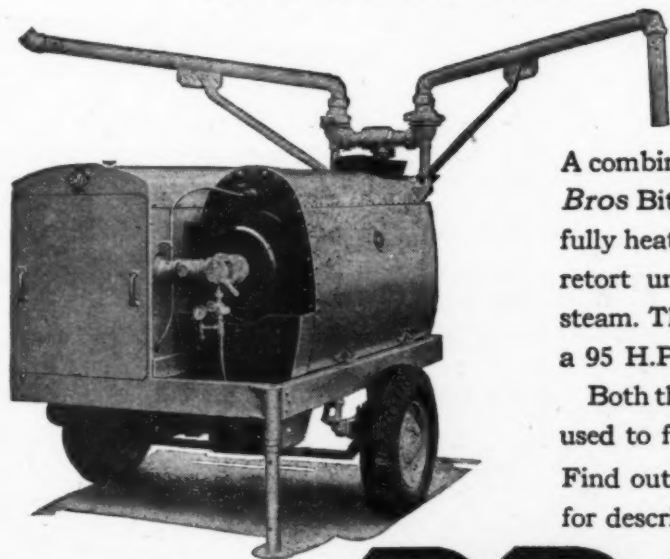
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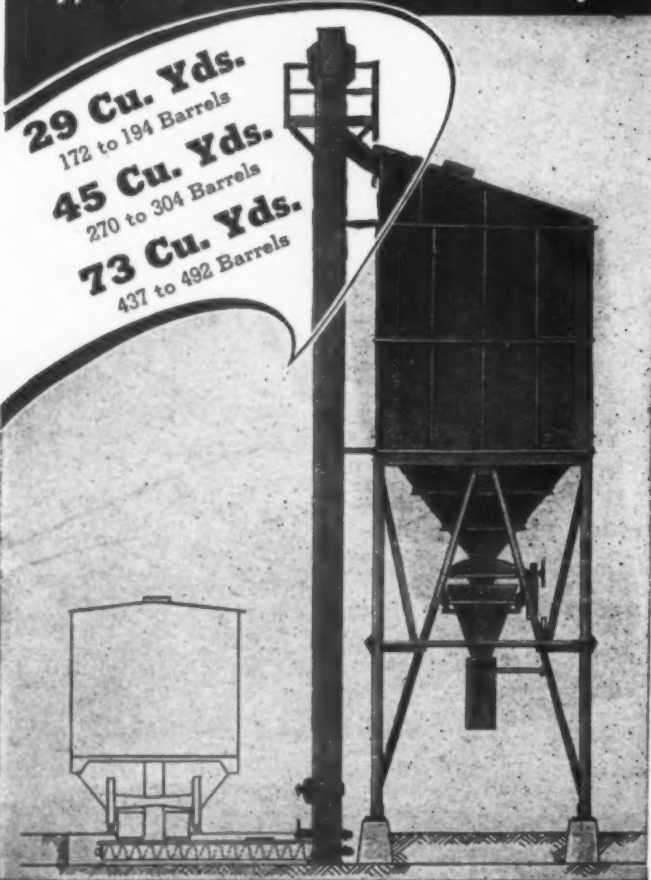
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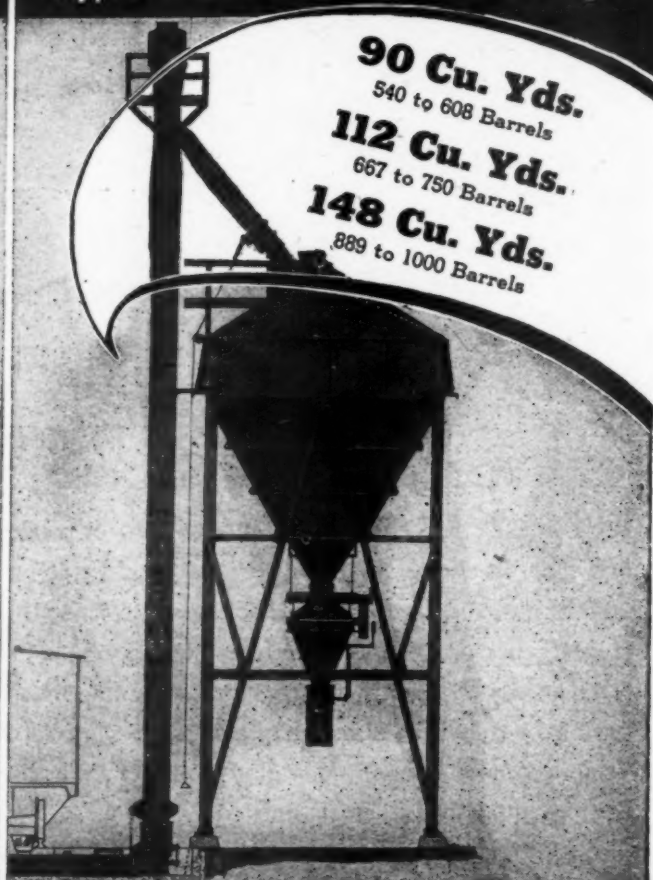
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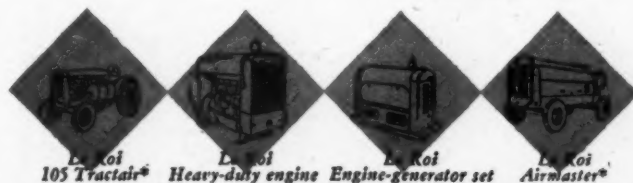
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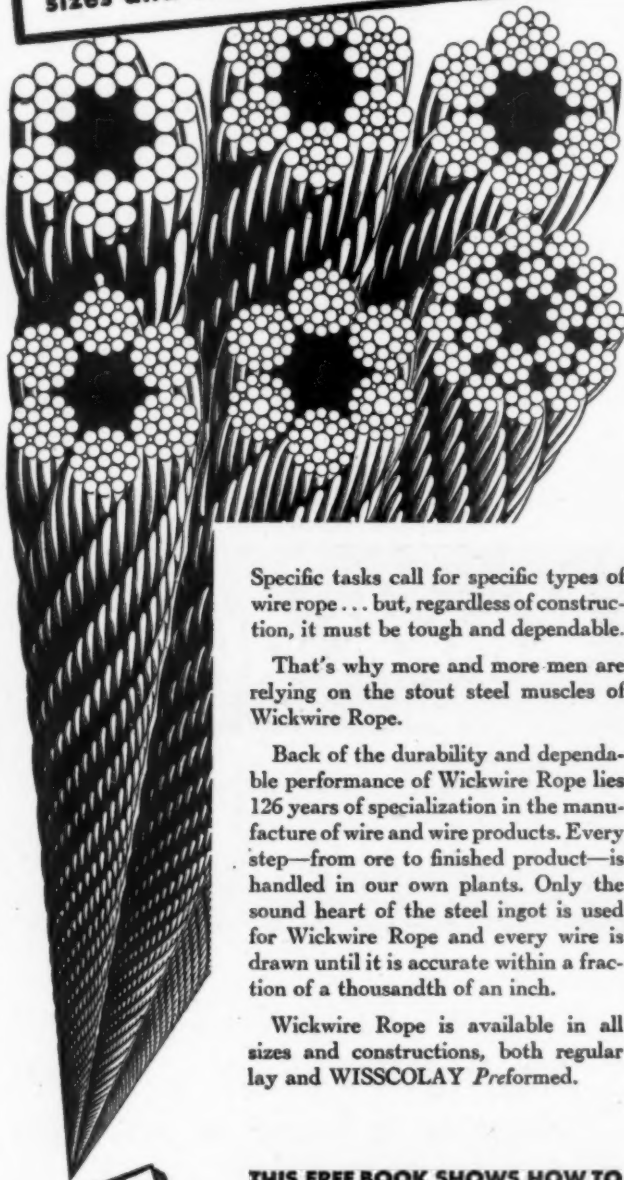
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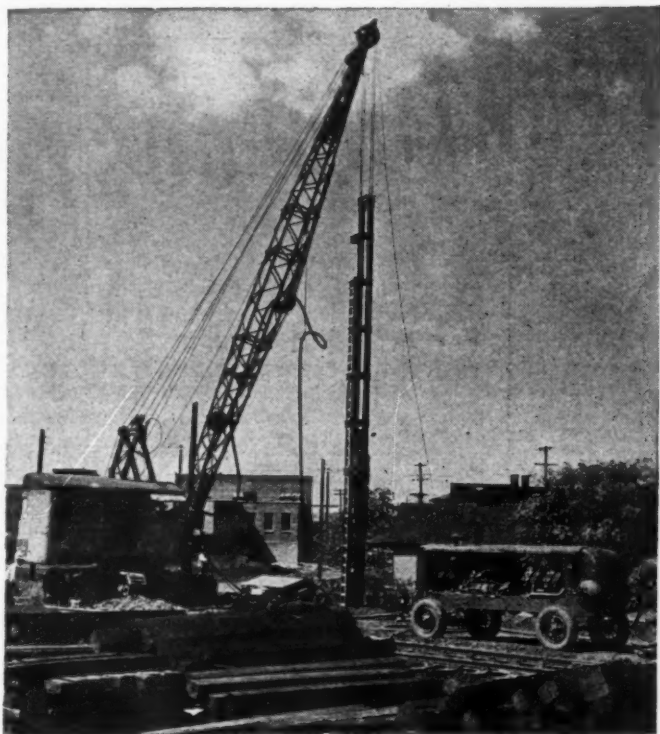
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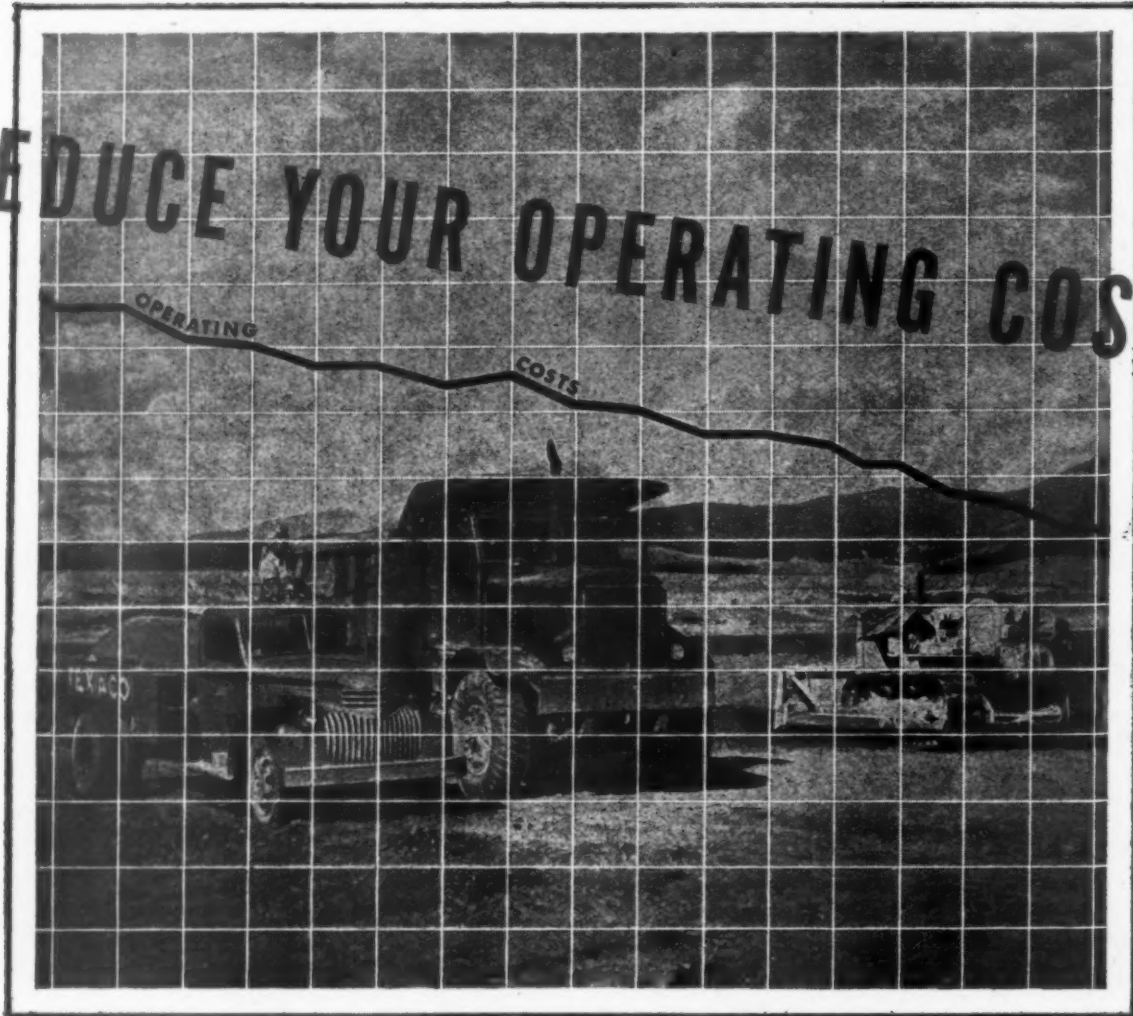
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Resurfacing US 40 Maryland

Inadequate drainage and foundation support causes of pavement defects. Contractor maintained traffic while widening, resurfacing and re-vamping drainage. Slag aggregate used in air entraining concrete

By H. K. Glidden

Contributing Editor

MARYLAND'S Pulaski Highway, US 40, from Baltimore north to Aberdeen, was completed in 1938. It was one of the early 4-lane divided highways in the country. Inadequate and unsatisfactory pavement drainage, together with a poorly drained foundation soil, resulted in continuing pavement troubles under a large volume of heavy axle-load traffic.

War's end permitted the long-awaited opportunity, and the state rushed through a resurfacing project to rebuild 3.33 mi. of this highway immediately north of Baltimore.

On the basis of bids received May 21, 1946, the Williams Construction Co. of Middle River, Md., was awarded a \$510,000 contract for this work, to be completed in 125 working days. Among the 50 items required to cover all phases of the resurfacing and widening the following were of special interest:

40,000 cu. yd. Class 1 excavation.	@ \$.65
30,800 lin. ft. removal of existing lip curb	@ .25
9,300 sq. yd. 9-in. reinforced cement concrete pavement..	@ 3.40
81,800 sq. yd. reinforced cement concrete resurfacing	@ 3.00
20,341 lin. ft. 8-in. perforated asphalt-coated corrugated metal pipe underdrain.....	@ 1.10
48,470 lin. ft. 6-in. perforated asphalt-coated corrugated metal pipe underdrain.....	@ 1.00

The existing roadway consisted of two 20-ft. roadways separated by a 30-ft. turfed park-area with raised crown. The two roadways of double-

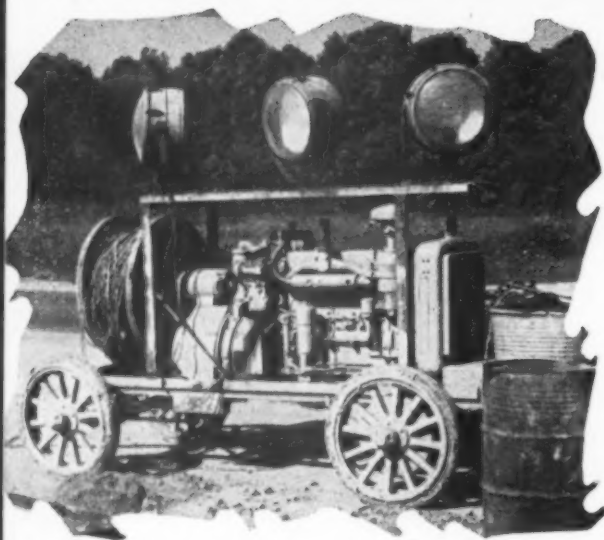
parabolic 9-7-9 concrete section laid directly on the subgrade. The pavement sloped uniformly inward toward the lip-curb, 3 in. high and 9 in. wide, along the inside edge of each roadway. These lip-curbs acted as gutters to collect surface run-off

from parkway as well as pavement. Water from both roadways was disposed of by emptying into catchbasins connected with cross drains.

Due to the nature of soil and failure of lip-curb drainage system to function as designed, subgrade sat-



★ Frequent samples of the air-entrained concrete were tested for air content and slump. Air content range was between 3% and 6%. Since old concrete pavement absorbed practically no water, it was necessary to keep slump low to secure best consistency and reduce water gain



★ Portable engine-generator plant, in addition to mounting flood lights, carried a large reel of cable for furnishing power to other electrically operated equipment. This equipment was used extensively as lateness of the season made nightwork mandatory

uration occurred frequently. Freezing temperatures often resulted in a hazardous accumulation of ice in the lip gutters and on the pavement surface.

In the absence of a protective sub-base over much of the poor subgrade material, the concrete pavement cracked badly and soon required extensive maintenance along the 23 miles between Baltimore and Aberdeen. Patching and replacing of slabs and mud jacking proved to be expedients only. It was obvious that some radical treatment would be the only satisfactory solution.

Reconstruction Design Principles

When it became apparent that economically-feasible maintenance would not suffice to prevent the pavement breaking up under the heavy traffic, plans were made to not only correct drainage design, but also to reinforce and widen the pavement.

Concrete resurfacing having been tried and proved practical on Maryland's roads, the idea was not new with the state. It was realized, how-

ever, that unless the drainage was made to function properly and the subgrade improved and protected as much as possible, any type of resurfacing would be only temporary.

The ultimate decision was to resurface the existing pavement with reinforced cement concrete after positive drainage and the best possible subgrade treatment had been provided.

Positive Subgrade Treatment

Slabs which had broken badly were removed and the subgrade carefully examined. In most instances the soil was found to have poor load-bearing value and so was removed to such depth as the engineer considered necessary and replaced with carefully compacted bank-run gravel sub-base. A minimum depth of 12 in. of subbase was also provided where new pavement was required at bridge approaches and other slab replacements. Subbase was placed in layers not exceeding 6 in. thickness with the top 6 in. layer having a plasticity index ranging between 3 and 6. This last provision was to insure that stakes driven to hold forms would provide firm support for placing the 24-ft. slab in one operation.

Broken and displaced slabs which could be salvaged were mud-jacked to grade where necessary and the cracks sealed. Hot asphalt was then pumped under the pavement at suf-

ficient pressure to insure all cavities being filled and to provide a water-proofing seal over the subgrade. The mud jacking and asphalt sealing were done by state forces.

Revised Cross Section

In order to give each roadway a center crown section, it was necessary to vary the thickness of the resurfacing because of the one-way slope of the original pavement. As is shown in the accompanying drawing, a parabolic curve resulted in a $7\frac{1}{2}$ - $7\frac{1}{2}$ -5 section. The 2 ft. of widening on each side consisted of a uniform 10-in. reinforced slab placed on from $13\frac{1}{2}$ to $19\frac{1}{2}$ in. thickness of subbase. The lip-curb was first removed by the use of jackhammers.

Special treatment was given bridge connections as it was undesirable to resurface them with a relatively thick concrete slab. The old pavement was removed for a considerable distance on either side of each bridge and rebuilt. A new 9-in. reinforced concrete pavement provided a varying section to supply a crown transition between normal roadway surface and the bridge deck. The new pavement surface was made 2 in. higher than the bridge floor and the bridge deck was then resurfaced with 2 in. of asphaltic concrete. The cross-section of the center dividing strip was also changed from convex to concave in order to drain surface water from the paved areas.

Calcium-chloride-treated gravel shoulders 9 in. thick were built along both sides of the new pavement, 7 ft. wide on the outside and 3 ft. on the inside.

Asphalt-coated corrugated metal pipe was used for underdrains and outlets, underdrain sections being perforated. The drains were located



★ Final distribution and manipulation of concrete were performed by a double screed, finishing machine shown here behind the spreader

along the edges of each roadway, 18 in. outside the new pavement line. Maryland No. 6 aggregate (1 in.-No. 4) and Class "A" concrete sand were used to backfill the underdrain trenches. The No. 6 aggregate served as a bedding and covered the pipe to a depth of 6 in. The remainder of the depth of the underdrain trench was filled with concrete sand.

Air-Entraining Mesh-Reinforced Concrete

Air-entraining portland cement, complying with the requirements of the "Tentative Specifications for Air-Entraining Portland Cement," A.S.T.M. Designation C-175-46T, was specified for all concrete pavements, subject to the following contract provisions.

"The amount of air-entrained in the freshly mixed concrete shall be not less than 3% nor more than 6% as determined in accordance with standard method of test 'Weight per Cubic Foot, Yield and Air Content (Gravimetric) of Concrete,' A.S.T.M. Designation: C138-44, or other method approved by the engineer.

"If the contractor finds it impossible to produce concrete having the required air content with the materials and mixing procedure employed by him, he shall make such changes in materials or methods of mixing or both, with the approval of the Engineer, as may be necessary in order to insure full compliance with the requirements of the specifications."

One of the accompanying photographs shows the on-the-job equipment the state's engineers used to determine the air content. The "Indiana Method" (developed by the Indiana State Highway Department) was used throughout the progress of the work for determining air-entrainment in the fresh concrete. This method provides for use of a hook gage in addition to other equipment specified under ASTM; C138-44. A sample field report on determination of air content is reproduced in the accompanying table:

Mesh reinforcement was placed 2½ in. down from and parallel to the surface of the pavement. The mesh was made of No. 1 gauge cold drawn steel wire welded into mats weighing 74.76 lb. per 100 sq. ft. and having 6 in. by 8 in. spacing of longitudinal and transverse wires respectively.

Emulsified asphalt was applied as a curing agent by means of a power spray at the rate of between 0.05 and 0.067 gal. per sq. yd. of pavement

★ Bulk cement was delivered to batching bins in canvas covered dump trucks

surface.

Doweled expansion joints using ¾ in. premolded cork were spaced at 360 ft. intervals, doweled contraction joints at 30 ft. intervals (immediately over the original pavement joints), and dummy-hinged joints at 15 ft. intervals. The mat reinforcing steel passed through the dummy-hinged joints, but was broken at all expansion and contraction joints.

Traffic Flow Maintained

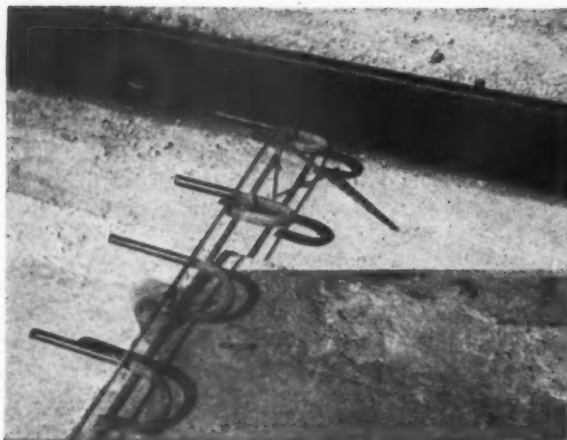
The Williams Construction Co., under the terms of the contract, was required to maintain traffic continuously with safety and without interruption at the several intersecting roads; also to maintain ingress and egress to adjacent business establish-

ments and private residences. In order to keep traffic moving along the Pulaski highway it was necessary for the contractor to confine his operations to one roadway at a time. High-early-strength concrete was used in certain locations to minimize delays in opening to traffic. The Maryland State Roads Commission furnished the contractor with the necessary signs for directing traffic. The contract contained an item covering the cost of handling traffic.

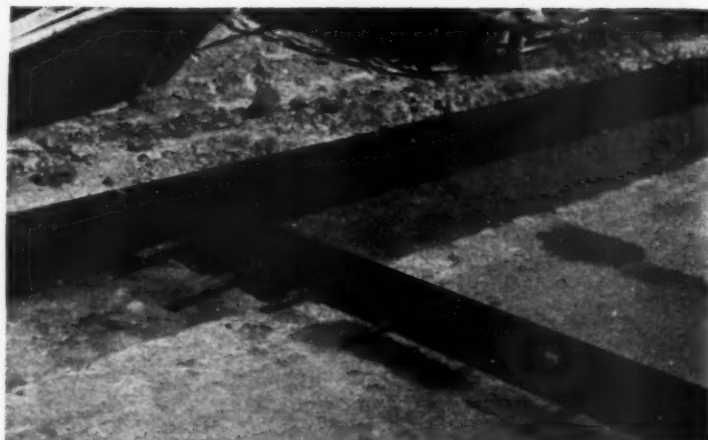
The contractor elected to use slag for coarse aggregate. During the early stages of the job, some difficulty was experienced in arriving at a design mix and water-cement ratio which would provide proper workability without undue water gain.

Date: 9/26/46	Project No. B-500-2-481		
Test Number	1	2	3
A Calibrated volume of container—cu. ft. ....	.498	.498	.498
B Weight of filled container with concrete.....	95.19	94.75	95.25
C Weight of container (empty, clean and dry).....	27.23	27.23	27.23
D Weight of concrete (B—C)	67.96	67.52	68.02
E Weight of 1 cu. ft. concrete $\frac{D}{A}$	136.46	135.58	136.58
F Weight of container and concrete sample.....	62.50	61.06	62.06
G Weight of container (empty, clean and dry).....	27.23	27.23	27.23
D Weight of concrete sample (F—C).....	35.27	33.83	34.83
G Weight of container, concrete sample and water to gauge point	74.38	73.31	74.19
F Weight of container and concrete sample.....	62.50	61.06	62.06
H Weight of water to fill container to gauge point (G—F)..	11.88	12.25	12.13
J Volume of water in cu. ft. $\frac{H}{62.355}$ .....	.19	.196	.194
V Calibrated volume of container to the hook gauge point..	.437	.437	.437
J Less volume of water—cu. ft. ....	.19	.196	.194
K Absolute volume of concrete sample in cu. ft. (V—J).....	.247	.241	.243
M Weight of solid concrete on air free basis lbs. per cu. ft. D/K	142.79	140.35	143.33
P Air content = $\frac{M-E}{M} \times 100$	4.43	3.32	4.7
Remarks:	Slump	1½"	1" 1½"





★ Welded dowel assembly is shown held in place by heavy spikes driven into joints in old concrete pavement. Top of spikes were cut off flush with top of assembly. Slag coarse aggregate and sand were batched from 3-compartment bin equipped with automatic weighing device



★ Expansion joints were spaced 360 ft. apart. In contraction and expansion joints $\frac{3}{4}$ in. plain round bars 24 in. long—12 in. on centers were used in resurfacing area. Size was increased to 1 in. in widened section. All dowels were painted and greased full length and at expansion joints metal caps were added as shown



★ Truck mounted compressor unit was kept on the job to operate air-driven equipment

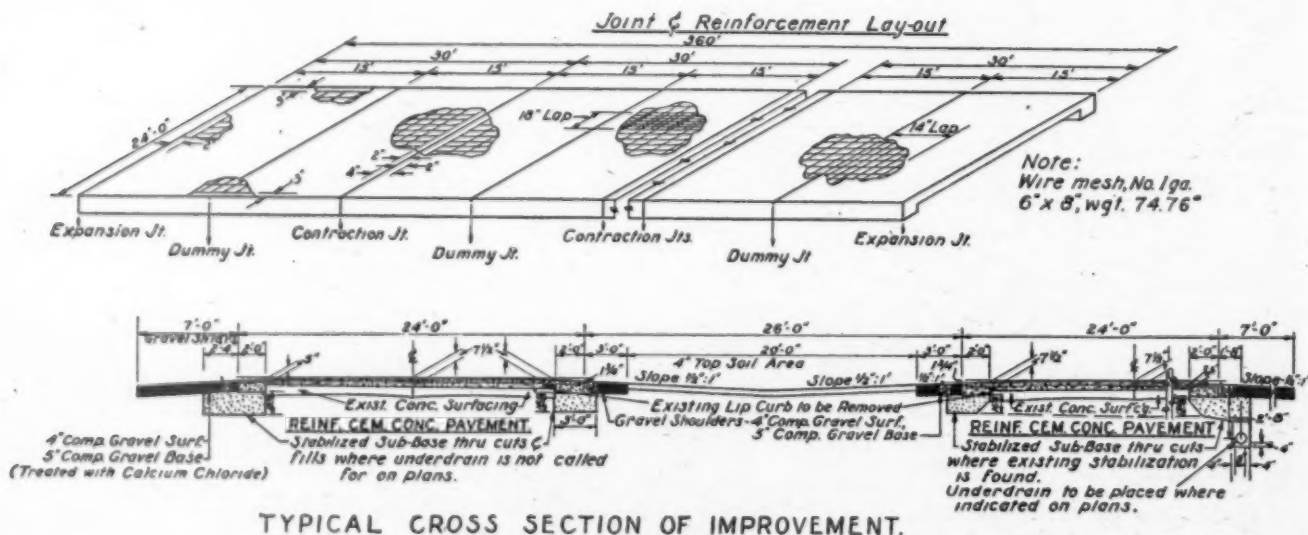
The impervious nature of the old concrete pavement prevented water from being otherwise taken up by the subgrade as is normally experienced. This condition caused the early abandonment of the practice of wetting down the old pavement prior to resurfacing. At the time the job was visited, concrete with 1 to $1\frac{1}{2}$ in. slump was working very well.

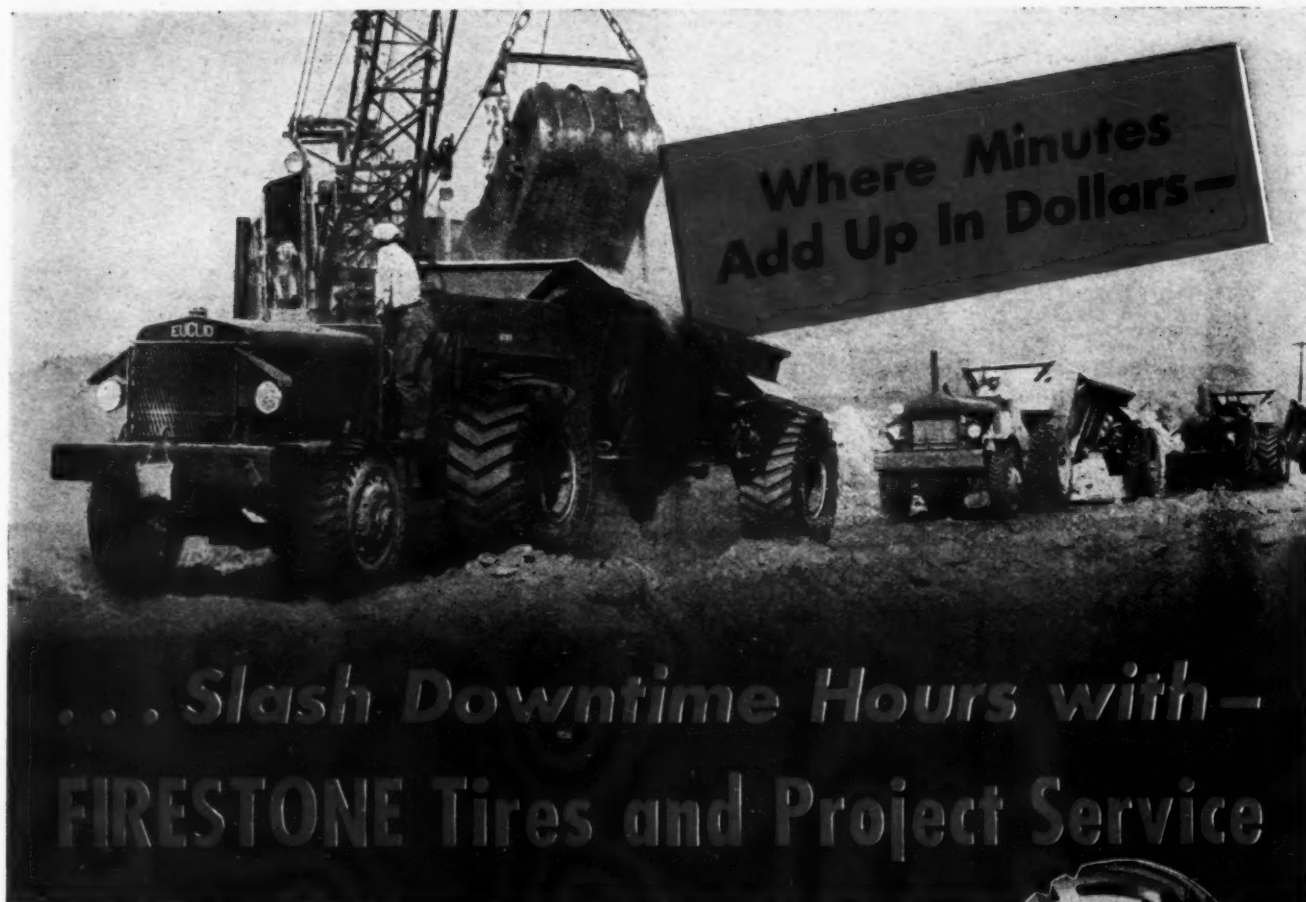
The concrete mix design, with slag coarse aggregate (used during the early part of the work) was as follows:

Cement factor, 6.0 bags per cu. yd.
Water (total), 6.0 gal. per bag cement.
No. 2 slag (2 in. — 1 in.), 50% (saturated in stock pile).
No. 6 slag (1 in. — No. 4), 50% saturated in stock pile).
Sand-aggregate ratio, 46%; consistency 2 in. slump; air content, 3-6%; average, $4\frac{1}{4}\%$.

However, excessive bleeding occurred which was finally reduced con-

(Continued on page 56)





EVERY contractor knows how quickly minutes add up in dollars of lost profit whenever any equipment "goes down" on the job. To avoid downtime due to tire failure, many contractors are using the new Firestone combination—off-the-highway tires and on-the-project service.

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★ Toll Roads, or More Gas Taxes?

Oklahoma of all states has worked itself up into a lather over a proposed toll super-road. As we go to press a measure providing for a bond-financed toll road paralleling US 66 between Tulsa and Oklahoma City has passed the State Senate there but is expected to be killed in the House.

We haven't looked into the merits of this scheme, or of other toll road proposals over the country, but one point is obvious: in nearly every case, this rash of toll projects reflects a local need for faster road progress than is in sight with present revenue sources. There is a degree of public need for the projects, or reputable engineers and other sincere people wouldn't be considering them seriously.

Elsewhere in this issue appears a strong statement against toll roads by the leader of a national highway user group. The public doesn't want toll-gate roads. The Public Roads Administration has campaigned steadfastly to eliminate them from the American scene. It is hoped we won't have to build the roads we need that way, but toll roads we'll have in increasing mileage if higher public road revenues aren't forthcoming in certain states.

As to legislative proposals to raise motor vehicle registration fees, the 1947 score to date is as follows: raises (5 to 40%) passed in five states, increases awaiting signature in two states, killed in four, being debated in six.

Higher gas taxes will go into effect in several states this year. Increases were proposed in 29 state legislatures up to May 1, but definitely enacted in only three: Colorado, 2 cents; Maryland, 1 cent, and Nevada, 1½ cents. A 2-cent increase in Maine and a half cent increase in Vermont await the governor's signature.

Measures are still pending in Alabama, California, Connecticut, Massachusetts, Michigan, Minnesota, New Hampshire, Ohio, Oklahoma, Pennsylvania, South Carolina, Texas and Wisconsin. Temporary New York increases were made permanent and extensions have been enacted in Idaho, Ohio and West Virginia.

A one-cent increase for the District of Columbia is pending in Congress.

But increases failed in Arkansas, Delaware, Indiana, Montana, New Mexico, North Dakota, Utah, Washington State, West Virginia and Wyoming.

Cities and metropolitan areas, too, are considering new gas taxes, which is a sad business because the funds so raised sometimes go to non-highway purposes.

The riding public wants new arterials, farm-to-market roads, expressways and bridges. But we're entering an era of less-easy spending in this country. Is there a real case for toll roads? For more gas taxes or license revenues? The public, and especially lawmakers, need more specific facts. It looks as if the economics and utilization phases of highway research must continue to be stepped up.

★ 1948 Road Show Ahoy!

After considering various rumored schemes and locations, the American Road Builders' Association has finally made definite plans to hold the first postwar Road Show July 16 to 24, 1948, at the big Soldier Field stadium on Chicago's lakefront.

We can all sigh with relief for this seems indeed to be a happy choice. According to ARBA Engineer-Manager Charley Upham and President Tom Callaway, there'll be 141,000 sq. ft. of space under the stadium structure, plus nearly a million square feet of outdoor display area east and south of the stadium—reminiscent of the 1933 Century of Progress which

occupied this general area. Three acres under roof and twenty acres adjoining will permit the most complete assemblage of modern road building and construction equipment in history.

Highway and street departments and contractors' organizations have plenty of time to arrange affairs so that key men can attend, in relays if necessary.

After eight long years without a show, this show is a "Must," and the nine-day stretch is provided to give everybody in the business, including superintendents and mechanics, a chance to attend. There'll be a trailer camp for those who'll come that way.

★ Those Alternate Routes

Here and there, as we drive about the country, we still find motorists confused over alternate route markings. The most frequent source of puzzlement and indecision is the Y-junction, approaching a community, where a city route and a by-pass are offered up to the motorist. Both will have the same number. If he's a stranger in the community, which will the poor fellow take? One may be called "Commercial"—what does that mean? For trucks? Or for the guy who wants to go in and stop at a dime store?

Other alternates are graced with letters, like U.S. 31 E and 31 W, or

U.S. 70 and 70 Alt. Some of these twin routes are quite long. Of course we know how this business came about—sometimes the compromise dates from local commercial influences which began in the old Good Roads days. Some date from the present U.S. numbering system, which is quite a masterpiece of numbering, come to think of it, in spite of the few spots we're complaining about.

The old days of outright subterfuge and deception are gone. The lingering sources of confusion due to alternate routes are minor by comparison, and it is hoped that the remaining trouble can be eliminated.

★ Maintenance Comes First

We recently drove through a state in the midst of spring weather conditions.

On a day dry enough to blade shoulders, dangerous ruts were in evidence along miles of slab edges.

Along certain lengthy stretches of arterial road wholesale destruction of concrete pavement was taking place due to pumping action which had obviously progressed far past the day when preventive or corrective maintenance should have been applied.

We saw rusty road signs, numerals and letters obliterated.

Also, while we're at it, scores of bridges so narrow that a car must wait for a truck to pass. It is to the credit of the highway department that these obsolete bridges, which number some of the worst found on main roads anywhere in the U. S., are well and conspicuously posted, and that their approach pavements have been kept in as safe condition as could be expected. But the lack of pavement and shoulder maintenance was so serious that we immediately

wondered what was the real reason.

It is true that this state's roads took a beating during the war, and that funds available for all purposes are inadequate. For these reasons, it would be easy to say that maintenance and repairs are in arrears because of lack of funds.

But this state is today letting new projects.

Which points to a fundamental stressed repeatedly in Mr. Motl's article in this issue: After debt service essential maintenance should come first, then what's left can go for construction.

This policy can save incalculable sums in the long run. Neglect maintenance and you have untimely repairs on your hands. Neglect the repairs and you have untimely and wholesale failure of roads. Why spend a million dollars in one part of the state building new projects while two million dollars' worth of damage on existing roads could be forestalled in another part by judicious expenditure.

★ Good Reading Any Time

One of our most common-sensical highway engineering teachers, Prof. Petty of Purdue, talked recently at the Florida road school.

As usual he put his finger on some of our biggest problems.

Under the query "Hear those bridges falling?" he outlined once again the whoopin' job we all have—state, county, township—of replacing dilapidated, narrow, weak structures. But he gently scored some officials for neglecting periodic painting, inspection and protective or preventive maintenance.

While sketching a picture of the tremendous need for all kinds of

highway betterment, he also warned that some fiscal belt tightening may be ahead for many governmental bodies including road commissions. The public is headed into an economy-conscious period. They'll expect tighter rein over budgets. If public opinion in favor of curtailment gathers momentum, he observed, some governmental units will be hurt, but many will benefit from the enforced necessity of resorting to greater efficiency, eliminating frills, giving more attention to securing qualified personnel and making a general housecleaning.

★ Short Course Speakers

This Spring the Texas A and M. highway engineering short course was held as usual. It was a two-day affair, one of a long succession of such annual events at College Hill Station that have meant a great deal to highway work in that state.

What interested us most was the type of program. In the first place there wasn't a single "outside speaker." Missing were the nationally prominent experts who could have

been invited to come from afar and give of their wisdom. (There are times and places for such fellows, don't get us wrong).

Missing too among the speakers were department heads and district engineers, with the single exception of a district chief who discussed apprentice training methods he is trying out.

The program consisted mostly of talks and discussions by "operating

men" of the Texas highway department—the department assistants and specialists who are carrying the real load and who are most familiar with over-all details and results. Contractor problems were also represented, but otherwise it was mainly a state department show, since so few Texas counties have engineers.

Each state has a different highway situation, of course, but building short-course programs around key operating men, with plenty of time for discussion, is certainly an idea to be recommended anywhere.

★ Engineers Visiting Each Other's Roads

It's good to see that engineers, singly or in delegations, are again making highway inspection tours and "see-how" visits to adjoining states. Late this past winter, before the construction season, a number of such visits were made. The engineers in question usually had specific soils or other material problems and methods in mind.

It is to the credit of the highway departments playing host that qualified personnel were given an OK to cooperate fully. Some states are out ahead on nearly every phase of highway engineering. Others are ahead in certain phases, and these aren't necessarily the states with the biggest programs.

We live and learn, and aside from habitually reading engineering literature, the progressive highway engineer needn't wait for some annual convention or short course to check into the successes of his brethren.

A monthly increase of 23,534 tons in bookings of fabricated structural steel was reported for the month of March, 1947. March's estimated total bookings, according to reports received by the American Institute of Steel Construction, Inc., amounted to 147,706 tons as compared with 124,172 for the preceding month. The estimated total bookings for the first quarter was 375,973 tons, an increase of 14.5% over the average of 328,416 tons booked in the same period in the averaged five pre-war years 1936-1940.

March shipments totaled 134,011 tons. Shipments for the first quarter totaled 405,542 tons or 37% greater than the averaged 296,235 tons in the five pre-war years. The tonnage available for fabrication within the next four months amounted to 614,023 tons.

(Continued from page 52)

siderably by the following adjustments in above mix:

Water (total), 5.5 gal. per bag cement.
No. 2 slag (2 in. — 1 in.), 43% (no wetting in stock pile).

No. 6 slag (1 in. — No. 4), 57% (no wetting in stock pile).

Sand-aggregate ratio, 44%.

Consistency 1½ in. slump; air content average, 4%.

As a matter of interest, in connection with efforts to reduce bleeding, it should be noted that uncrushed gravel coarse aggregate was used on two days' paving operations. The sand-aggregate-ratio was 32% and water ratio was 5.0 gal. per bag. The air content was 3½%. There was no bleeding.

Construction Equipment

All mixing and hauling equipment was operated outside the forms within the center dividing strip area which will have a width of 26 ft. after completion.

Paving equipment consisted of one 34-E dual drum paver, reversing blade concrete spreader, double screed finishing machine, longitudinal power float, joint strip installing machine,

and belt finish.

Water delivery to paver was by tank truck. Batch trucks hauled two batches each.

Because of late start, all paving was restricted to the northbound roadway between the Baltimore city line and a point near the traffic interchange to Glenn L. Martin bomber plant. All of this pavement was completed and opened to traffic. The remaining work will be completed during the spring of 1947.

It is of interest to know that this job is the largest concrete-resurfacing highway project now under construction in the east. Traffic counts have shown that this section of highway has averaged more than 21,000 vehicles daily.

The work is being done under direction of Robert M. Reindollar, Chairman, Maryland State Roads Commission. Wilson T. Ballard is chief engineer; T. M. Linthicum is construction engineer; D. P. Campbell is district engineer; J. E. Wood is materials engineer and Paul A. Kempter resident engineer.

Important Function of the A.I.L.H.A.

A lusty 2-year old—the American Institute of Local Highway Administration

By Charles M. Upham

Engineer-Director, American Road Builders' Association, Washington 4, D. C.

FARM-TO-MARKET roads are vital in our national life. They serve 6,000,000 farms with an annual production exceeding 12 billion dollars. Over them must pass the products and materials that feed and clothe 140,000,000 people. Over them annually millions of children are transported to and from school. Over them 32,000 mail carriers drive daily. The nation depends on its rural roads.

Administering these local highways is a man-sized job. Our 3,000 counties supervise more than 2,400,000 miles of county, township and village roads. This is about three-fourths of the entire national highway system. But a wide variety of method has been used in administering this supervision.

States and counties have lacked uniformity of organization and procedure. One county did things one way. Its next-door neighbor often did

things another. The passage of the Federal-aid Highway Act of 1944, making possible the greatest program of rural road construction and maintenance in the country's history, brought local conditions into sharper focus. Something should be done to help local administrators in their new problems and responsibilities.

The American Institute of Local Highway Administration, founded at the convention of the American Road Builders' Association in Chicago in 1946, provides a working organization to serve the interests of local roads and their responsible administrators. The County Highway Officials' Division of ARBA, formed in 1927, was the sponsoring body.

Sleeves Rolled Up

It was frequently emphasized at the ARBA convention in Chicago last February, the first anniversary of AILHA, that this was no paper association, but an earnest, sleeves-rolled-up organization intent on securing for

local roads the recognition, cooperation and funds they deserve, and for seeing that such aid once secured was properly administered for the greatest good of the local community.

Officers elected for 1947 include A. O. Cuthbert, Lansing, Mich., as president, and F. Ray Williams, Saratoga Springs, N. Y., A. L. Burrus, Union City, Tenn., W. M. Biays, Russell, Kans., and F. L. Phipps, The Dalles, Ore., as regional vice presidents.

There is a definite place in our highway building program for AILHA. With the resourceful leadership it has and the fast growing membership among outstanding county officials throughout the United States, the organization, which has just blown out the single candle on its birthday cake, should go far and be a power for good.

Judge Gilbert Smith of Anson, Texas, was the first president, with F. Ray Williams, Saratoga Springs, N. Y., Ed L. Almand, Atlanta, Ga., A. O. Cuthbert, Lansing, Mich., and F. L. Phipps, The Dalles, Ore., as regional vice presidents.

AILHA is national in scope with each state having from one to three delegates from state associations of local road officials, a form modeled on that of the Congress of the United States. Members eligible include policy-making officials, county judges, county commissioners, local supervisors, county engineers, county and township highway superintendents and other local administrative officers. The potential membership is therefore comprehensive.

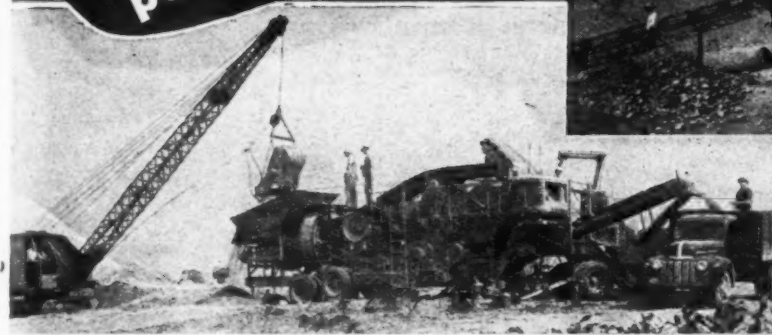
At the start of its second year, the institute already has 14 states represented and 19 state organizations affiliated. Affiliated organizations include such groups as state associations of township supervisors, county highway engineers' associations, county judges and commissioners' associations, county highway commissioners' associations, county highway superintendents' associations and others. More than 46 state associations of officials have responsibility over local roads in the various states. Some states have three such groups.

The purposes and objectives of AILHA as set forth in its constitution are: "To furnish a medium for nation-wide coordination of activities and a unified expression of official opinions and recommendations relative to matters affecting local jurisdiction and administration of county and local roads and bridges; to assemble, disseminate and emphasize information bearing on the welfare of local highway administration relating to federal, state, local and municipal

(Continued on page 92)

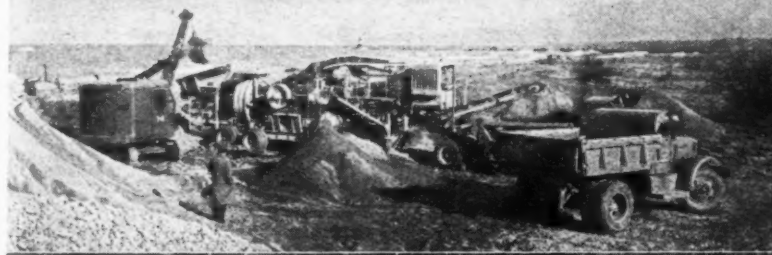


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The Importance of Maintenance

In Our Highway Program

Upkeep and repairs will continue to take a growing share of the highway dollar. A new concept of the maintenance function is necessary, notes this veteran administrator

By C. L. Motl

Maintenance Engineer, Minnesota
State Highway Department, St. Paul

THE burden of keeping the highways serviceable during the war years became the responsibility of maintenance organizations—and the record proves, I believe, that this responsibility was met with credit and distinction.

Resumption of construction work, with its controversial plans and planning, its natural glamor, and its mass impact on communities benefited, will no doubt relegate the inconspicuous work of maintenance to a secondary position in the public eye. Like the housewife in the home, the maintenance man on the highway will be doing what he is supposed to do, and "why get excited about it."

Deterioration Continual

Before we start discussing details that disclose the real importance of maintenance, we should perhaps touch on the fundamental characteristics of its need.

Many of you, no doubt, have taken part in a road opening, where the parade marches, the bands play, the ribbon is cut and speeches are made. Even while this is going on, a change is taking place over the completed project. An unseen and irresistible force of deterioration has taken pos-



★ Highway grade separations are not effective under all conditions!

session, never to relinquish its destructive grip until the project is destroyed. Engineers and builders have tried through the centuries to resist this force by selecting more durable materials, building with greater care, and doing everything else within their power to make their work permanent. Success to a greater or lesser degree rewarded their efforts, but none has attained real permanence. To counteract destruction and prolong life, some maintenance operation was inaugurated.

Nothing can be permanent without

maintenance. We might add that the chief characteristic of permanence of any man-made structure is a need for maintenance. In the case of a road, which is subjected not only to weathering but traffic use and abuse, what chance do you think it would have, of surviving a serviceable life of even a few months, without maintenance?

Most states through mandatory laws provide for maintenance of roads. In some states, Constitutional Amendments authorize road building but require proper maintenance for the roads after they are built. Funds for maintenance are usually given precedence; construction is financed out of moneys remaining after maintenance has been provided for.

The Federal Government, while making no contribution toward maintenance of federal-aid roads built jointly with states, keeps a watchful eye on all completed federal-aid projects and requires that suitable main-



★ Plowing out highways during storms involves special problems

Condensed from a paper at the 33rd Annual Road School, Purdue University, Feb. 4, 1947.

tenance be provided, as a major pre-qualification for additional F. A. construction. The high priority accorded road maintenance requirements during the war likewise stands as a testimonial to its need and importance.

Point of Disagreement

Agreed that maintenance is important, but when we try to pick out the details and operations that make it important, we may be far apart in our thinking. This nation's 3,000,000 miles of roads represent many types, built and maintained under many different conditions. There is a wide difference of opinion on how they should be maintained, by whom, and at what cost.

It takes big money to maintain roads.

Latest estimates available indicate that local road authorities other than states spend over two-thirds of their road funds for maintenance. State authorities spend almost half of their funds in normal times; in recent years, over half. More than \$1,100,000,000 (estimated) was spent for road maintenance in 1945, and costs and expenditures are still climbing.

The question most frequently asked is—how much should it cost to maintain a road? Based on many years of experience and effort, here is the correct answer: "All you can get out of the Boss."

Let's examine this answer more closely. Those familiar with road maintenance know that there is a broad upper limit to the amount and quality of work that can be performed. There is, however, a rather narrow range to the lower limit. Somewhere above the lower limit is the proper level of maintenance operations for each highway. The financial resources of a governmental unit, public attitude and demands for maintenance, the confidence of the Boss in the maintenance organization, and other considerations, enter into decisions on maintenance budgets. The effect on the construction program is often an important factor controlling

maintenance budget allowances above minimum needs.

Fig. 1—Maintenance Fluctuations

This figure illustrates how a maintenance budget can be affected over a decade by a variety of circumstances. The early part of the graph represents a period of free spending; the abrupt drop was caused by financial difficulties and a reorganization of state government; the war years were conservative, followed by a return to greater activity because of public demand, road needs, availability of men and materials and ample funds.

Fig. 2—Range of Expenditures

Note here that many maintenance items can use a wide range of expenditure, depending upon the degree or excellence of maintenance desired. Take for instance, Roadside Mowing. You can spend a few dollars or several hundred dollars per mile each year, depending upon whether you wish merely to cut down the high weeds once a year, or keep the roadside mowed and trimmed like a lawn. The same is true of such items as plowing snow, ice control, providing so-called

safety signs and devices, and lighting, and in doing such other work as may come within the scope of traffic service operations.

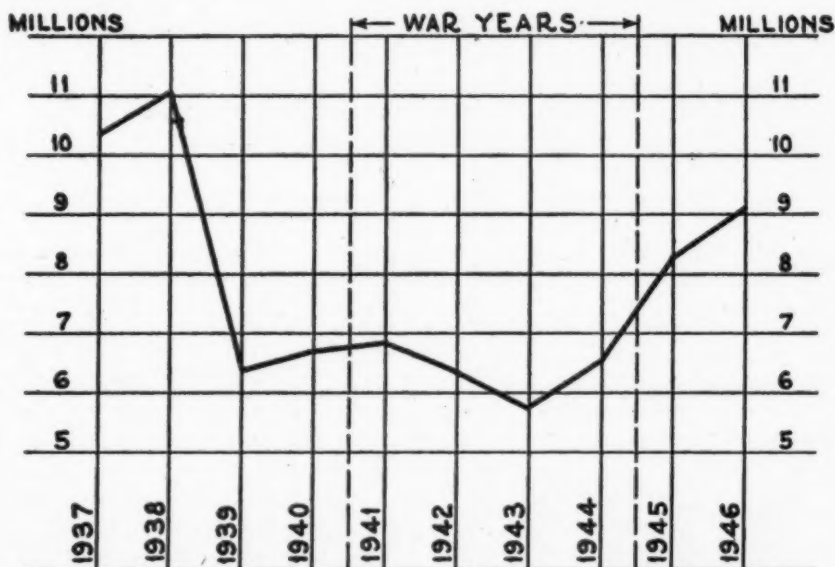
Fig. 3—System Variations

Note the great variation in expenditure on different parts of a main highway system. Types of construction and traffic volume account for the difference in Col. 1 and 2, while type of construction is the chief reason for cost difference in Col. 2 and 3. The road represented in Col. 3 is a multi-lane road with intricate service drives, numerous grade separations with connecting roads, and with broad roadside areas landscaped and seeded to grass.

Fig. 4—Weather Effect

Note how differently weather and climatic conditions can affect the budget during the winter months. Some winters, maintenance takes over twice as much money as in others.

It can be seen, therefore, that any over-all road maintenance operation requires careful planning, budgeting and controls if best results are to be secured with available funds. Good



★ Fig. 1—Expenditures for ten-year period—Maintenance on trunk highways



★ (Left): Modern grading on important road, illustrating high grade line and backslapping of cuts. (Right): Old type road grading, developing numerous snow traps

Minnesota Department of Highways—Maintenance Summary, Districts 1-17 & 23
T. H. Control Sec. Dist. Period Jan. through Dec. 1945

Class	Item	Operation	Operation Totals	Item Totals
Routine Maintenance	1 Roadway Surface	1. Patching and repairing 2. Dragging, blading, scarifying..... 3. Filling and trimming cracks and joints	\$1,152,575.51 537,274.43 54,080.41	\$1,743,930.35
	2 Shoulders and Side App.	4. Patching, dragging, blading, filling ruts, etc. 5. Reseeding and resodding 6. Bit. treatments and replacement of like material	\$ 240,824.82 1,836.46 506.14	\$ 243,167.42
	3 Roadside and Drainage	7. Cuts, fills, slopes, slides, washouts, etc. 8. Drains and drainage structures (under 20 ft.) 9. Cutting and clearing vegetation and brush 10. Roadside developments 11. Msc. structures and facilities.....	\$ 17,043.25 284,045.37 629,059.19 61,040.17 13,568.21	\$1,004,756.19
	4 Traffic Service	12. Markers, signals and devices..... 13. Traffic and guide lines..... 14. Guard rail	\$ 99,477.02 45,701.16 47,944.38	\$ 193,122.56
	5 Snow and Ice Control	16. Erection and removal of snow fence..... 17. Removal of snow 18. Sanding and ice control..... 19. Removal of ice and snow to open waterways 20. Removal of ice and compacted snow	\$ 223,248.26 602,171.19 317,865.04 15,793.48 51,170.39	\$1,210,248.36
	6 Structures	21. Cleaning 22. Repainting 23. Repairing	\$ 3,434.52 176.49 116,244.47	\$ 119,855.48
	Grand total—routine maintenance.....			\$4,515,080.36
Special Maintenance	1. Application of dust palliatives.....	\$ 55,710.69		
	2. Replacement of like material to surface	468,561.99		
Extraordinary Maintenance	3. Bit. surface treatm't, seal coat, etc.	1,920,642.00		
	4. Mud-jacking and pavement repair.....	32,770.08		\$2,477,684.76
Betterments	1. Roadway surface or roadbed.....	\$ 23,017.93		
	2. Shoulders or roadside.....	39,841.88		
Grand total—direct charges.....	3. Drainage facilities	6,387.50		
	5. Handling and protecting traffic.....			\$ 69,247.31
Grand total—direct charges.....				\$1,250,608.57
Grand total—direct charges.....				\$8,312,621.00
Recapitulation	Labor	\$2,415,870.98		
	Material	1,569,631.34		
	Equipment	1,931,765.97		
	Overhead	740,843.74		
	Contracts and special agreements.....	1,654,508.97		

★ Fig. 2—Maintenance expenditure items

maintenance planning provides for work items in the order of their importance, with room for necessary adjustments as work progresses, and then provides for embellishments and refinements when and where they can be financed. Only experience can provide the wisdom to choose a reasonable answer.

Maintenance Elements

The principal elements comprising a maintenance operation are briefly: personnel, materials, and equipment. Securing these in adequate amounts is not too difficult in normal times. However, providing these in proper proportions to take care of each maintenance requirement, on several thousand miles of a highway system, on a timely and efficient schedule, is a matter requiring a high degree of knowledge, experience and administrative skill.

To perform the road maintenance work of all the governmental units of this country, the employment of many thousands of persons is required. A large percentage of money spent for maintenance is paid out in

wages, and it is therefore important that competent administrative processes be utilized to the fullest extent for economy's sake.

"Political" Costs

In a governmental unit such as a state, where several thousand people are often employed on road maintenance, it is no easy task, even under the most favorable circumstances, to select and assign employees to tasks most suited to their qualifications. Unfortunately in too many cases the highway maintenance organization is

considered as a suitable field for taking care of community misfits and incompetents, and is also a fertile field for the so-called "spoils system." Politics is the indispensable life-blood of our form of government and therefore cannot be characterized as something evil and useless. However, its impacts on road maintenance employment, together with other undesirable employment practices, can constitute a very large non-productive item in a road maintenance budget. Here is a good field in which to search for some of the economies needed to help counteract the fast rising costs of maintenance.

In some states, Minnesota included, Civil Service has been set up by law as an inducement to attract competent persons to public service, and keep them there. It worked advantageously during the prewar and early war years. But since the laws, philosophies and policies of Civil Service are intended to operate as a selective process, it is natural that the process does not function properly when there is a scarcity of material. In the long run and with growing experience, Civil Service can do much to improve competence and efficiency in public employments, but it is by no means the complete and automatic solution to the employee problem. There is the possibility that the shrubs of legal protection, intended to screen the employee from the unjust supervisor and the eyes of the spoilsman, may also become the bushes in which the employee can hide from the gaze of administrative authority.

Regardless of the manner and direction from which we view the maintenance employee, he should be accorded a place of at least equal importance with materials acquired and used under carefully prepared specifications, and equipment should be secured and operated with much detailed attention to its upkeep effectiveness and efficiency. Good employees and good employee relations, if fully utilized, are perhaps the best means of conserving taxes intended for road maintenance purposes.

Maximum and Minimum Expenditures for Maintaining a Mile of Trunk Highway in Minnesota—Seven Year Average

Control section	(a) No. 0401 Light Gravel	(b) No. 2744 Concrete	(c) No. 2735 Bituminous
Road type	40	5700	5900
Average daily traffic	60.99	104.49	360.49
Roadway surface	3.04	175.31	35.57
Shoulders and approaches	17.10	427.29	914.21
Roadside and drainage	4.10	58.16	69.64
Traffic service	18.88	261.94	505.22
Snow and ice control	.21	.13	4.97
Structures	50.04	.....	638.90
Special surface maintenance	3.60	40.00	.24
Extraordinary maintenance	157.94	1,065.31	2,529.24
Total			

(a) Light type gravel through forest and swamp area.

(b) 3-lane (old) road simple construction.

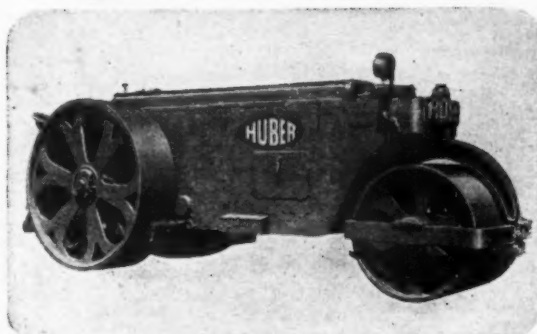
(c) Multi-lane expressway with separations and extensive roadside developments.

★ Fig. 3—Maintenance expenditure variation

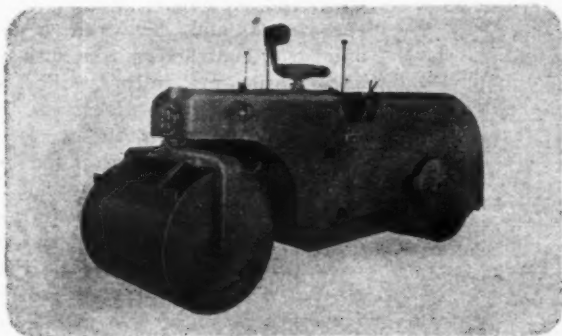


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TELL ME YOU NEVER
SAW HUBER ROAD
MACHINERY IN
Action..."

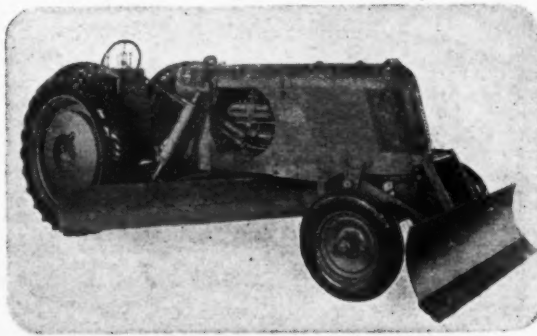
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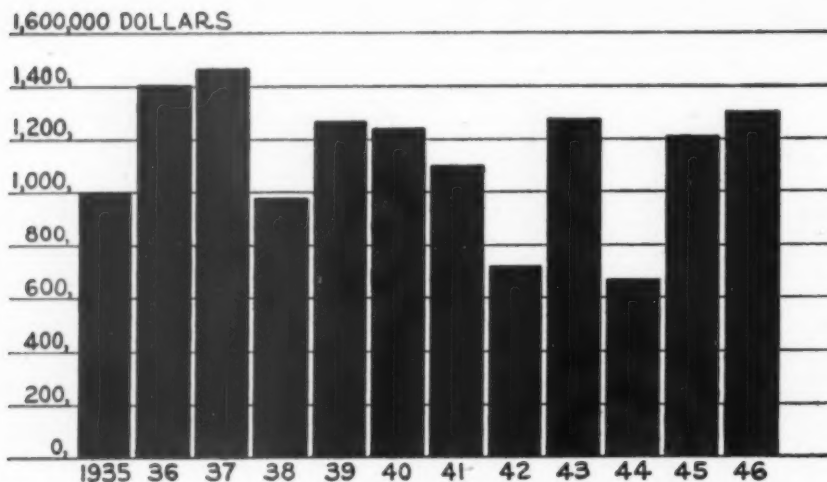


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★ Fig. 4—Effect of weather on maintenance budget—Minnesota, snow and ice control expenditures, Division of Maintenance

Materials: A Selection and Use Problem

Materials for road maintenance take about one quarter of a maintenance budget. In large organizations, such as in states and cities, and in some counties, the materials are usually secured under specification and inspection control, but the selection of the proper material in the proper amounts is still the responsibility of those who use them on the roads. If maintenance is to be successful, this segment of the over-all operation must be performed with *knowledge* and *competence*, since proper use of a material is about as important as the quality itself.

The smaller units of governments can, and do, usually benefit from the standards set up by the larger units, because the materials involved are usually more readily available than any others.

Equipment Use

Equipment is being utilized to a greater and greater extent to perform maintenance and combat the rising costs involved. Here again, about one-quarter of the cost of direct labor maintenance-work is consumed by equipment charges. In normal times the market offers a wide variety of equipment, machines, and tools, with

improved models succeeding each other with each passing year. It is an arduous and difficult task to make a proper selection from what is available, and an even more difficult task to determine when replacement of old or obsolete equipment is advisable.

Fig. 5—Equipment Costs and Expenditures

Information shown here suggests the relative importance of different items and costs in an equipment oper-

Maintenance Equipment Cost Summary for Year Ending June 30, 1946, Minnesota

	Gallons	Amount
Diesel fuel	223,028.50	\$ 20,511.91
Gasoline	1,601,676.10	237,957.24
Lubricating oil ...	37,783.25	11,796.64
Grease		4,028.79
Repair parts		207,107.21
Labor (for repair of equipment)		290,737.96
Tire expense		51,927.17
Storage		76,769.96
Misc. oper. supplies.....		40,266.34
Direct operating costs.....		\$ 941,102.12
Depreciation		244,813.55
Overhead (supervision, buildings and minor items).....		263,772.89
Grand total operating cost.....		\$1,449,688.56
Rental earned		\$1,577,683.83
Original value of equipment.....		\$4,883,891.37
Present depreciated value of equipment		1,067,946.72
Estimated original value of old and obsolete equipment that should be replaced....		1,400,000.00

★ Fig. 5—Equipment costs and expenditures

ation. In Minnesota, for instance, we have a revolving equipment fund, against which we charge all items for equipment purchase and upkeep. The fund is replenished from equipment rentals charged against field operations, according to a predetermined schedule of rentals. Rentals determined from cost data are set up for each type and size-group of equipment, and each group is expected to *earn* its way. Rental rates required disclose the relative efficiency of equipment types, and the inefficient units in any group. To assemble this information, it is necessary that thorough daily reports be made on each piece of equipment operated, and reports be processed along proper channels so that the resulting information reaches the administrative personnel who should profit by the knowledge.

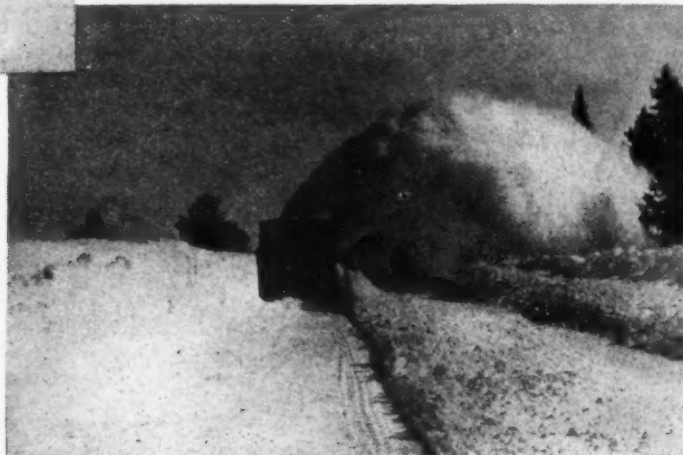
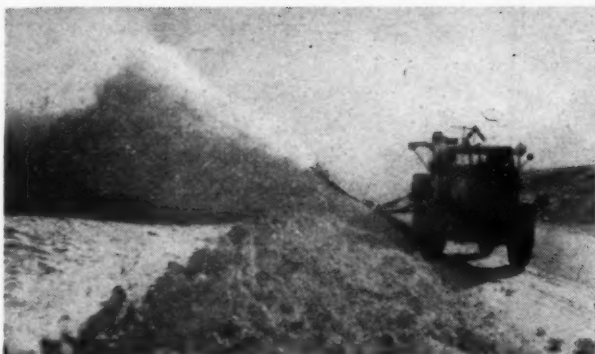
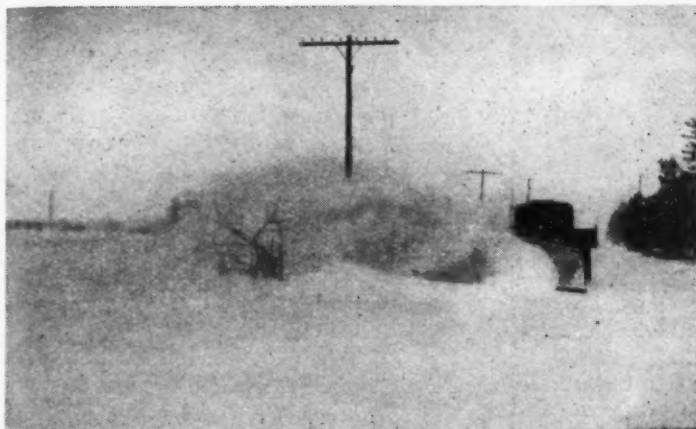
The administrator of road maintenance should, therefore, keep up to date on equipment uses and new developments and I know of no better way of doing this than maintaining contacts with those who make a livelihood out of selling equipment and materials. These men are a constant source of education in progress toward better ways of doing things—and I pause here to recognize the contribution they have made to road program.

Contract Maintenance

At this point we might touch on the contract system in road maintenance. There is some difference of opinion on where and when the contract system can be utilized. Minnesota utilizes the contract system wherever and whenever possible. This policy has encouraged and developed a large number of contractors, who with their organization are fully familiar with our problems and requirements. They bid aggressively for the work, and usually complete it within the short periods of time usually specified. No project is too small or too large to attract these contractors if the work requirements are clearly set forth and the *basis* of payment *plainly* defined. Having a group of contractors available for doing seasonal and emergency



★ (Left): Motor grader equipped with "V" plow and side wing; an effective snow removal unit on secondary roads. (Right): Modern light duty one-way snowplowing unit



★ (Upper left): Light duty one-way plowing unit in action. (Upper right): Snow wing equipped with roto and used to remove roadside snow accumulations. (Lower left): Rotary wing cleaning up roadside accumulations. (Lower right): Heavy duty rotary plow opening up heavy drifts

work, makes it possible for the public or day labor organization to be kept at a level of maximum efficiency for year around employment.

To illustrate how this works out in practice, Fig. 6 has been prepared which shows the monthly variation in maintenance expenditures, and the benefits realized through the use of contractor organizations.

Fig. 6—Day Labor and Contract Expenditures

On the slide a horizontal line represents average expenditures by direct labor operations. The curve above this line is just about equivalent to our contract expenditures. If all the work were being done by direct or day labor, it is quite likely that the expenditures in the low month periods would be higher and inefficient, while some of the operations in the higher month periods would not be reached unless more funds were provided.

The full value of maintenance operations cannot be realized unless reasonable and informative records are kept of the work performed. Maintenance should encompass more than a mere patching and upkeep; it should also furnish a revealing record of the comparative suitability of highways for the carrying of traffic, and the weaknesses in road design and con-

struction, if any exist. This objective can only be attained if the men who perform the field work submit careful and accurate reports on their daily operations. These daily reports will also be one of the principal sources of information used by officials in determining maintenance needs and policies. Too much stress therefore cannot be placed on the importance of keeping and submitting accurate and complete records of all maintenance activities, including costs of operating equipment, as well as costs of labor on the highways.

Maintenance organizations are responsible for maintaining traffic on many roads awaiting construction. The maintenance of a road should be the process of keeping it in good condition and repair, strengthening its minor weaknesses, revising minor details to improve it, and providing accessory services necessary to make the roadway more usable under adverse weather conditions and changing traffic. Maintenance experience and records accumulated over a period of years should, therefore, be one of the most reliable and authentic sources of information for pointing out the requirements of road need and design. Those who maintain the roads face the realities of road use and road deficiencies and should be capable of offering good advice to those peering

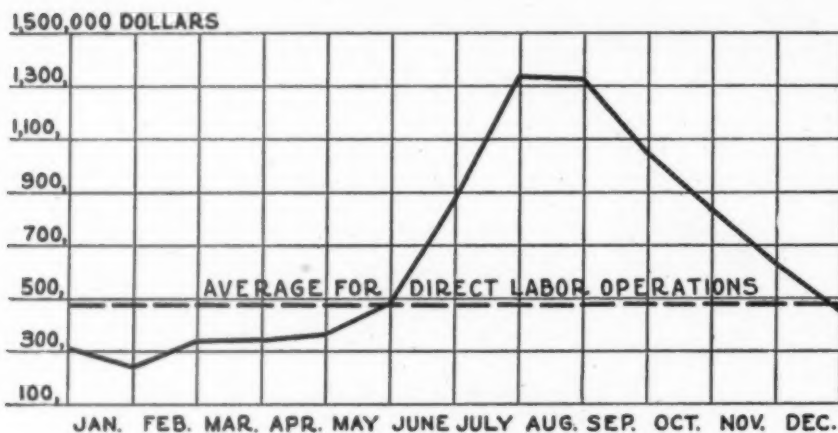
into the future through a maze of curves, charts, tables, formulas, and what have you, trying to determine what should be done.

Maintenance Never Solved

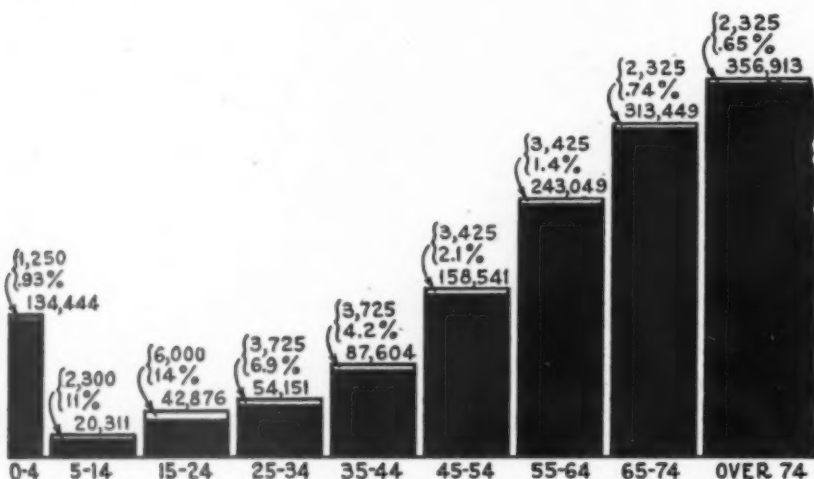
I have, like many others, hoped that the construction programs would solve many of the difficult maintenance problems. In spite of the remarkable advancements made, maintenance problems seem to be growing in numbers and in magnitude, and one comes to the conclusion that we never solve a maintenance problem—we merely change its nature.

Therefore, I am among those who do not feel too optimistic about some of the solutions being offered by those sincerely trying to solve the highway and traffic problems of today and the future. In this postwar period, when everybody seems to expect the unusual, the superlative and the grandiose; we find ourselves in the midst of a super-road thinking era that is receiving wide favor, but may lead us astray.

On our 3,000,000-mile highway system at least one-third must logically be of primary importance and at least another one-third should be in need of centralized maintenance attention. Recent tendencies reflect the erroneous belief that concentration of attention on about 1% of the nation's highways will go a long way toward solv-



★ Fig. 6—Day labor and contract expenditures in Minnesota by months, typical year, 1945



★ Fig. 7—Age groups—Relation of Minnesota traffic deaths to total deaths in the U. S. by age groups for year 1945

ing our road problems, including costs of maintenance.

There is reason to doubt that the super-improvement of the 1% can have a too salutary effect on the other 99% and on our transportation problem as a whole.

Traffic congestion in urban areas, already congested, is likely to be aggravated instead of relieved by greater concentration. What the annual maintenance costs on some of these proposed roads will be, is beyond the thinking of those who are planning them. Apparently, the assumption is that the maintenance costs, whatever they may be, will be fully justified. Such costs will be an addition to and not a replacement of any part of present maintenance expenditures.

Future Cost Burdens

The cost of construction, no matter how great, is often a secondary item compared to the perpetual upkeep costs thereafter. Many communities are now in financial difficulties because they no longer can maintain and

keep up the facilities they have built in the past for their economic welfare. It would, therefore, seem to be wise before a new facility is constructed, to consider not only its first cost, but also its continual maintenance costs thereafter. I am sure that many so-called civic developments (parks, memorials, buildings, roads and other civic and publicly owned facilities) would never be built if say a 50-year maintenance cost estimate had been included in the original estimates.

Perhaps a greater utilization of existing facilities might provide a satisfactory answer at a much lower cost of burdensome and consuming maintenance. The correct solution is not what we *would like* to have, but what we can afford in fairness to all concerned. I believe it can be generally assumed that necessary maintenance costs will sooner or later be proportional to original construction costs, and where special service expenditures are also involved the maintenance costs will be correspondingly greater.

Heavier Loads

Another important maintenance problem is the rapid increase of heavy traffic loads. When road building programs were first launched on a large scale about twenty years ago, the common slogan was "Let's get out of the mud." This was accomplished to a large extent through low cost roads. Motor vehicles were mostly of the passenger car type, with a few light trucks. The highways we have today were largely built and financed for such use by taxes paid by passenger car and light-truck owners.

Heaving load hauling is now a rapidly expanding segment of our transportation economy and is spreading out over the nation, and scarcely a road is without some heavy-load use. I am not among those who seem to believe that a four or five-ton wheel load is merely a soothing caress on the fevered brow of an exhausted highway. On the contrary, I am convinced that heavy-load traffic is adding a growing burden of maintenance to *all* roads, and to "low cost" roads particularly. Only a comparatively few roads are capable of withstanding frequent use by very heavy loads. Costs of repairing broken roads are rising, and there is no foreseeable hope that reconstruction can overtake the retrogression of our highways unless some plans far greater than any proposed, so far, are formulated and put into effect. This statement is made from personal observation while driving through a score or more states recently.

Unbelievable progress has been made in extending a road system to all corners of the nation. These roads in general are satisfactory for the type of vehicles that have paid most of the taxes to build them. Now all of a sudden a type of road use (the heavy load) is spreading out rapidly over these roads, most of which were not designed for or intended to carry frequent heavy units. There is no possibility of changing these roads overnight into heavy transportation arteries. This will take time and billions of dollars. In the meantime, *maintenance organizations* must meet the situation as best they can.

The problem of the heavy loads on highways *must* be solved before rising costs of maintenance can be halted. If heavy loads could be confined to a few miles of specially built roads, it might solve the problem in part, but the need of truck transportation is as universal as the need of roads; and if all areas in the nation are to be served impartially, the problem is not so easy of solution. The answer seems

(Continued on page 71)



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JOB and EQUIPMENT IDEAS

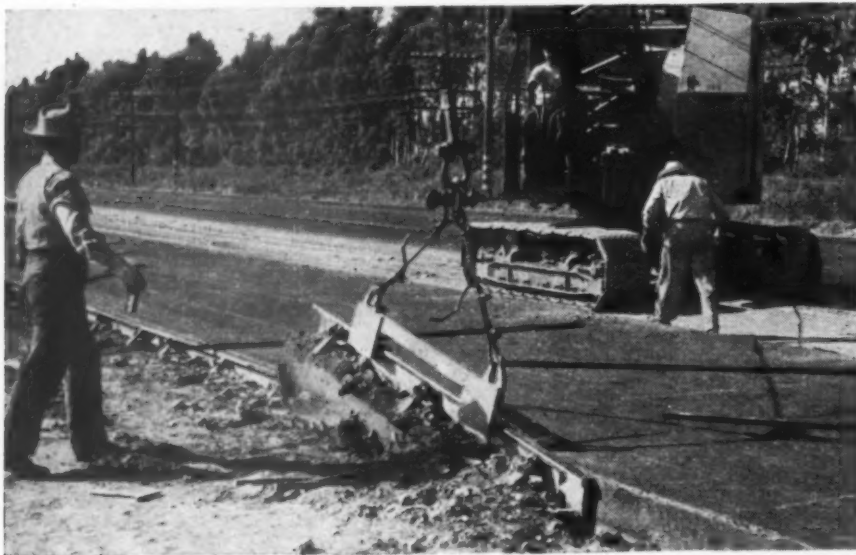


Roadside Men Plowed Snow

According to a Connecticut state highway department bulletin, it should not be assumed that roadside development forces hibernate in winter. Between storms if the Connecticut bureau's equipment and men can be released from the job of combating ice and snow, work on the war-imposed backlog of sight-line clearing is resumed. One thing

which World War II did not stop was the growth of trees, shrubs and bushes along Connecticut's highways.

The Dutch elm disease is seriously attacking the state's elms. Present methods of control are to trim out all infected and suspicious portions of affected trees and burn the cuttings. This work as well as the work of removing other dead or dangerous trees along the highways is also carried on during the winter months when possible.



How Asphalt Workers Can Avoid Accidents

National Safety Council Construction
Safety Instruction Card No. 326.

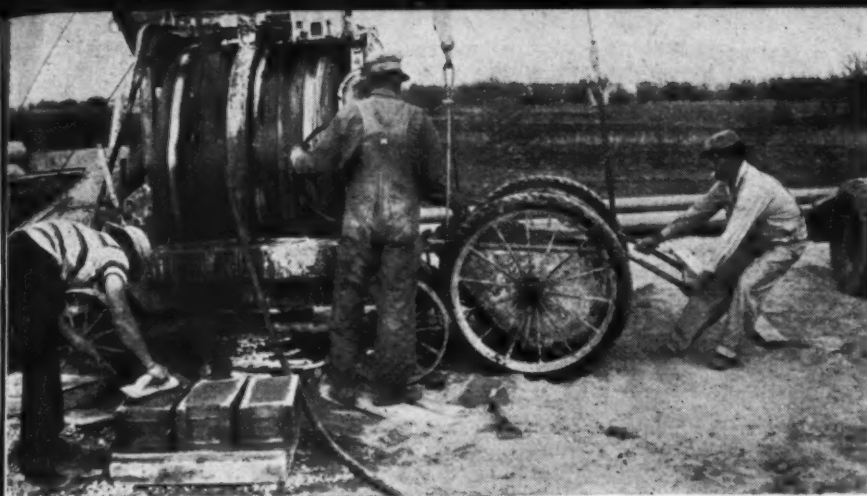
When working around the melting kettles care must be exercised in avoiding many hazards. Here are some precautions:

1. Make sure that kettles are on a firm level foundation.
2. See that kettles are absolutely dry before putting hot asphalt in them; also that asphalt is dry before re-heating.
3. Avoid over-heating the asphalt.
4. Be careful when the first batch is melted; if it foams, reduce the heat and stir vigorously to prevent foaming over.
5. If vapor changes to a dense yellow, the batch may catch fire. Reduce heat immediately.
6. Always have fire extinguishers handy, and be sure you know how to use them.
7. Wear garments that cover your body completely, sleeves reaching over wrists, jumper buttoned to neck, and trousers over shoe tops.
8. Gloves should be worn continuously; but not gauntlet type.
9. If hot asphalt splashes on your skin, apply promptly as a solvent a solution of carbon tetra-chloride, coal oil, benzine, or gasoline; then see a doctor.

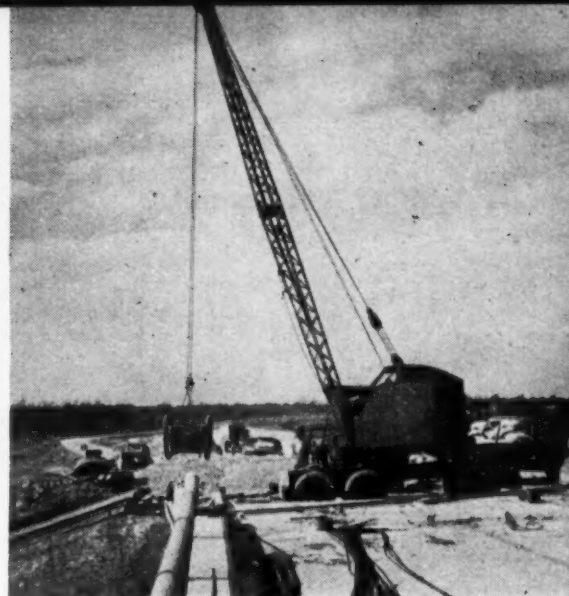
One Way to Handle Road Forms

Road forms on Basich Bros'. U.S. 101 paving project in Southern California last year were pulled loose, picked up and piled on a big trailer by a crane with a special pair of handling plates, as pictured here.

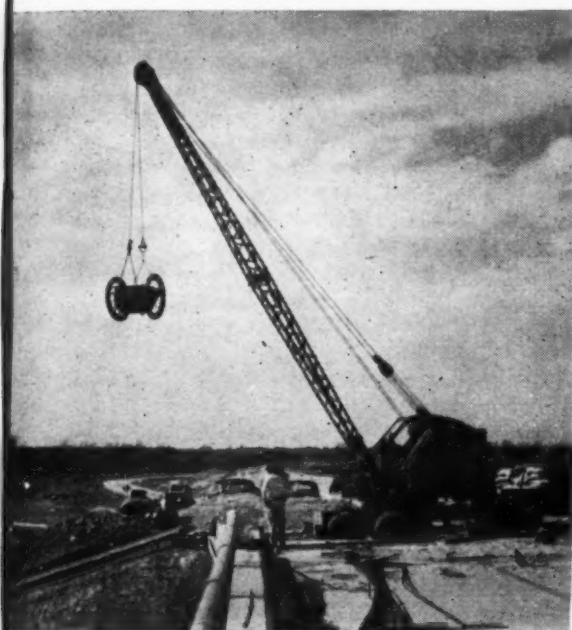
This was a long project (several miles, we forget exact length), and consisted mainly of the addition of two lanes to convert the route to a 4-lane highway. A crawler crane, which performed various clean-up duties, was equipped with the sling shown and special grappling plates which hooked the under side of the rail head. One or two men first came along and removed form pins. Then the crane did its stuff, the operator giving a slight wrench outward as he lifted, to work the form of the slab. Several form sections were taken up with each move-up of the crane, and in a matter of minutes the trailer was loaded and on its way up ahead. Forms were not visibly damaged by this method of handling.



1 Concrete-filled buggy, being wheeled clear of the mixer for hoisting



2 Buggy starts up, operator at the same time slowly lowering the boom angle to get the reach needed



3 Boom on the way down, load well up in position for spotting and being swung through small arc involved



Concrete Riprap Placed by Raising and Lowering Crane Boom

The photos of the truck crane with the concrete buggy sort of explain themselves. Yes, you're right, the crane just stayed in one position at the end of a bridge, took concrete from the mixer alongside while the boom was up, and dropped concrete in place for bank paving while the boom was lowered almost to a horizontal position.

This trick was observed on Southern Contracting Co.'s I-beam bridge project south of Bonham, Texas. Considerable concrete yardage was involved in rip-rapping around both abutments, with a nice radius design lending an artistic touch to the finished work. Ordinarily the procedure would have been to fill a buggy, wheel said buggy down a plankway

laid over the rip-rap area, and dump its contents. This would have necessitated a rope snub, and still required four or five men to hold the buggy under control. Wheelbarrows would have been equally laborious, and either way meant a chance for mishaps and possibly accidents.

Superintendent Drew figured that the idea of reeving the boom up and down for each batch saved worthwhile time and money.

Truck Ferry Service Planned Across Lake Michigan

Both highway traffic and lake shipping in the Chicago-eastward area will be affected by plans for fast large-scale ferry service between Chicago and the Michigan cities, South Haven and St. Joseph. Spokesmen

4 Boom almost down to horizontal—buggy being tripped and concrete deposited over wire mesh reinforcement for 4-in. bank pavement. Trench around circular toe of bank is for riprap footing, two men handling the bucket, a finisher, two helpers, one man on the mixer and one on the crane—that was the whole crew, all taken from other parts of the bridge job

for commercial trucking interests say that a water jump will cut trucking and trailer hauling costs, which have gone up steadily per mile of highway operation. Auto and passenger business would be combined with the contemplated service, which according to a Chicago Tribune article will be faster than the circuitous highway hauling which is up to twice the mileage.

Turf

on Mechanically Stabilized Shoulders

Tests show value of stabilization, but type of mulch not found important, and expense of raking, rolling and other familiar cultural steps proved unnecessary under the conditions encountered

By Harry H. Iurka

Landscape Architect, New York State
Department of Public Works,
Babylon, L. I.

A STUDY of the construction of mechanically stabilized road shoulders which will support the growth of a good vegetative cover under occasional traffic and which will also be stable, is being made on Long Island by the New York State Department of Public Works, under District Engineer J. J. Darcy. Field tests were established during the spring months of 1945 and 1946 and observations of performance have been made regularly since construction.

Description of Conditions

The test areas are located in the south-central part of Long Island

where the topography is flat, the area being characterized locally as scrub oak with vegetation being largely a low growth of oak and pine. The original soil is classified as sassafras sandy loam. The light character of the woodland cover results, during periods of high temperatures, in rapid evaporation which, together with the poor moisture retention of the soil and the frequent summer deficiency of rainfall, is severe on plant life.

The test shoulders were constructed on state highways having two lanes of concrete on each side of a wide turf mall. Profile of grades is less than 1%. The traffic count for a 12 hour period in 1946 was approximately 5200 on one road and 7200 on a second road.

Two distinct soil conditions were encountered at the time of the con-

struction of the tests. In one section the soil was a sandy material, much of it having so few fines that it was unstable under traffic. (See Fig. 1 and "Before" photograph.) In the second instance there was a top soil of approximately 6 in. depth which had been imported to cover both the shoulders and the backslopes and which, although agriculturally good, contained such a high percentage of fines (up to 60% silt and clay) that it was unstable under traffic when saturated with water. There was a good turf growing on it. This top soil was underlain by a layer of 6 in. of sandy material (see Fig. 2.)

Field Tests Described

Some 3000 ft. of test shoulder was constructed in 1945 on the sandy material. In 1946 another 5500 ft. was constructed of which 2500 ft. was on

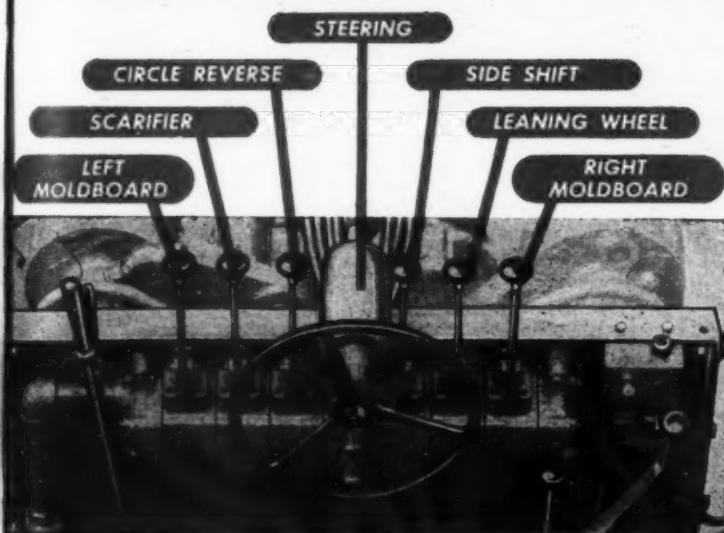
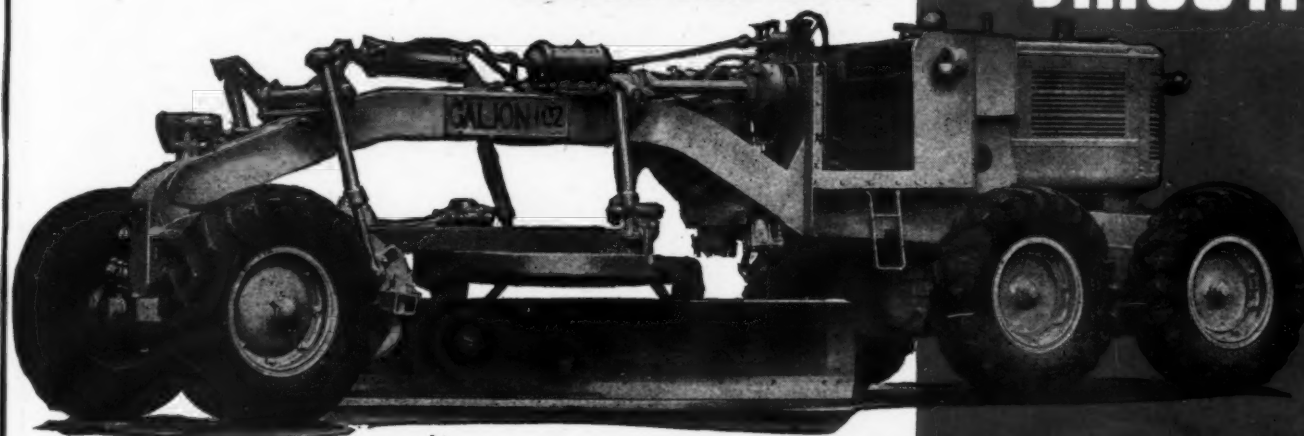


★ Before and after stabilizing a sandy shoulder. Ready for seeding. Note resistance to rutting of stabilized area

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★ Showing stability of a completed shoulder after season of turf growth. Rut was caused by a car stuck in the sand. The wrecker crossed the stabilized strip without rutting

the original sandy material and about 3000 ft. on the original heavy top soil material.

Soil mixtures were designed to meet AASHO specifications for stabilized courses. Only a small quantity of binder soil was added to the sandy material to provide the minimum amount necessary. This was incorporated to a depth of 6 in. Sand was added to the heavy top soil material of the shoulders in the second instance by plowing up about 6 in. of sand from below into the top soil and also importing some additional sand. All these materials were thoroughly

mixed by harrowing. Water was added to give approximately optimum moisture content, the soils were mixed and then compacted by a smooth roller and the shoulder was shaped to a pitch of $\frac{1}{4}$ in. to 1 in. per foot for the width of either 10 or 12 ft.

The test shoulders were divided into areas for the test of various factors and these areas were further subdivided for the test of the variance of any one factor. Included in the factors so studied were the effect of type of soil material, degree of compaction, kinds and amounts of

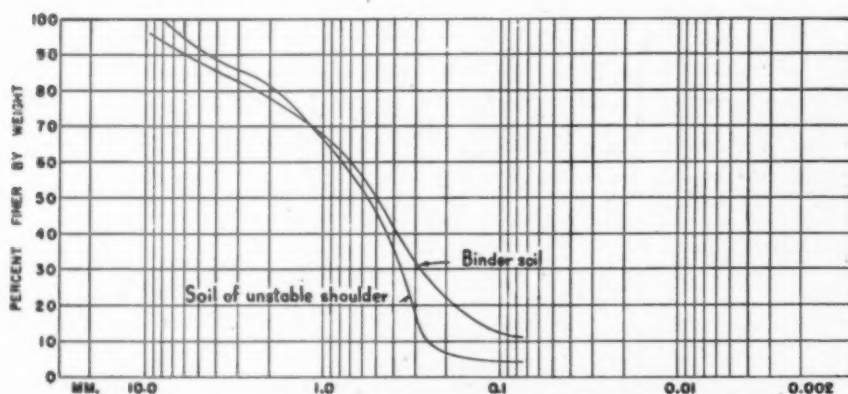


FIGURE 1. SIZE DISTRIBUTION CURVE - SANDY SHOULDERS

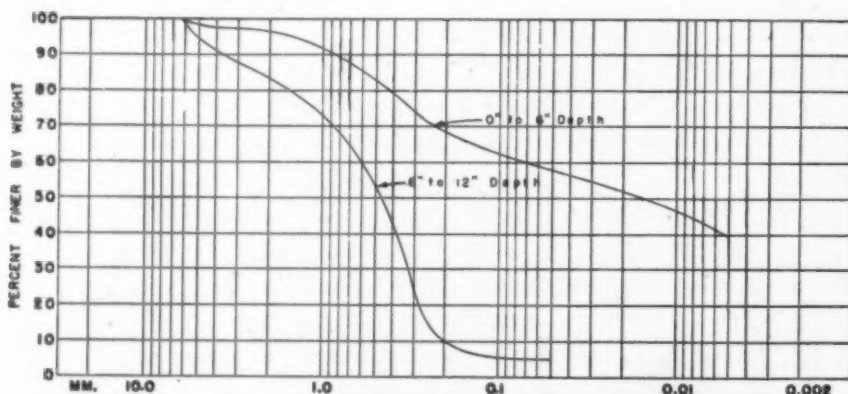


FIGURE 2. SIZE DISTRIBUTION CURVE - TOPSOIL SHOULDERS

organic materials, fertilizers, lime, mulch materials, variety of seed and the rate, season and method of seeding.

Analyses of samples of the stabilized soil materials indicated that they were similar to those specified by AASHO for Type A materials varying in the amount passing and No. 200 sieve from the minimum of 5% to more than the maximum of 25% and varying from non-plastic to above the specified liquid limit and plasticity index. Compaction was varied from a maximum to a minimum. Organic materials incorporated were duck manure, local peat, peat moss, and a combination of chicken manure and peat moss. Fertilizers were both organic and inorganic and were varied in composition. The hydrated form of lime was used. The mulches used were peat, peat moss, chicken manure and peat moss, duck manure, salt hay, pine needles, hardwood leaves, straw, mowings, stone chips, grits, sand and cinders. Some 60 different kinds of seed were used. Rate of seeding was varied from a minimum of 25 lb. per acre to 200 lb. per acre. Test seedings were made at all seasons of the year. The method of seeding was varied to test the effect of omitting such usual operations as rolling and raking.

Maintenance has been purposely limited to the usual standard practice, which means that to date no application of fertilizer has been made after construction, and mowing was less frequent than it should be for best results.

Results Summarized

Valuation of the tests is based on (1) stability, (2) character of vegetation.

Density determinations have been made and comparative results of growth of vegetation have been recorded from regular observations. These have been supplemented by a photographic record. Bearing tests to be made in the spring of 1947 will be correlated with the density determinations and soil analysis.

All of the shoulders built on the previously sandy material have been stable under traffic without any damage to the surface during even the worst period of the year. The section of shoulder built of the top soil material has been stable under traffic but has given indication of some rutting when saturated during thaws. A part of this may be due to the presence of a higher percentage of fines than specified for the mixture in some places as well as to poor drainage conditions. There is a great improvement, however, over the pre-

vious conditions which resulted frequently in cars being mired in the top soil.

Dry densities up to 134.7 lb. per cu. ft. were obtained. A point of interest was noted in making density determinations in the fall of 1946. These determinations were made for 3 in. increments of depth. It was found that almost invariably the top 3 in. layer was less dense than the next lower 3 in. layer. Since compaction was done with a smooth roller in at least 6 in. lifts, it would seem reasonable that the top 3 in. was compacted to at least the density of the next lower 3 in. This may indicate a decrease in density of the top 3 in. during the growing season of the plants. Such a decrease in density would be a factor in the "build up" of the shoulder.

A satisfactory turf has been grown on the shoulders subjected to occasional traffic only, even where the greatest density was obtained. The turf is not satisfactory where it is subjected to daily use, as at mail boxes where delivery is made once a day.

A more pure stand of turf developed on the stabilized shoulder in which the binder soil was not a "top soil".

A very economical seeding method included in the tests gave satisfactory results. The seed was spread by a seeding machine over an unprepared seed bed and covered with a light layer of sand applied by a sand spreader such as is used in sanding icy pavements.

Considerable sheet erosion occurring on a newly stabilized and seeded shoulder in the spring of 1945 indicated the value of a quick germinating seed in the seed mixture or as overseeding. Rosen Winter Rye overseeded lightly has been excellent for the purpose as it not only germinates quickly but also dies out very soon when seeded in spring.

Conclusions

Analysis of results of the study to date seems to indicate the following conclusions for the conditions encountered in the tests to date under Long Island conditions:

1. Mechanically stabilized soil shoulders, which are stable under traffic, will support a satisfactory turf growth when subjected to occasional use by traffic.
2. Adequate drainage is essential.
3. The type of mulch material used appeared to have no appreciable effect on the growth of turf on the shoulders of the tests.
4. Many of the cultural practices of establishing turf, such as raking and rolling, may be eliminated with



★ Same shoulder after summer and autumn growth of turf. Dry density of shoulder in middle distance was 129.2 lb. per sq. ft. for the top 3 in. and 135 lb. for the next 3.5 in. depth

resultant economies and no decrease in the quality of turf required for highway shoulders.

5. Top soil appears to have been unnecessary to secure a satisfactory turf on these tests.

6. Rate of seeding, season of seeding and kind and amount of fertilizer are of relatively lesser importance within reasonable limits.

7. The varieties of plants rated best after two seasons growth under the conditions of the test are: Red Fescue, Smooth Brome, Orchard Grass, Redtop, Perennial Rye, Wild White Clover, Birdsfoot trefoil, Yarrow.

\$20,000,000 Street Lighting Program for N.Y.C.

During the next ten years, New York City plans to spend approximately \$20,000,000 for new street lights and for increasing the power of many lights at present locations, it was announced recently. Program will be under the direction of the Department of Water Supply, Gas and Electricity. John M. Canella, Commissioner of the Department, announced that the Department has already contracted for \$1,100,000 worth of new lighting equipment. Engineers, headed by Nicholas J. Kelly, department chief, are preparing plans for additional \$600,000 purchase of lighting fixtures. Encouraging the Department's program, Mayor O'Dwyer is reported saying that brighter street illumination would be a crime deterrent. Among streets to be relighted are such famous thor-

oughfares as Park Ave., Fifth Ave. and Broadway. It is expected that approximately \$2,000,000 per year will be spent to complete the program. (New York Times, February 21, 1947)

The Importance of Maintenance in Our Highway Program

(Continued from page 64)

to be, either, *lighter loads* or some new type of vehicle that will eliminate the concentration under axles and their round wheel contacts with road surfaces.

Seasonal Limits

In many states there is also the problem of freezing and thawing effects on road carrying capacities. Thousands of miles of roads capable of carrying *occasional* heavy loads during the summer and winter can support only light vehicles, if any, during the thawing season. The only answer seems to be seasonal load restriction. If restrictions are properly set up and enforced, usually over 95% of customary traffic, including a large percentage of all trucks, can continue to use the road.

The restriction and preservation of roads, where practiced, is usually the responsibility of the maintenance organization, supported by the traffic enforcement division. Here is another responsibility that discloses the importance of maintenance in our highway economy.



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
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Mr. Robert A. Swanson, Treasurer, S. B. Thomas, Inc., Long Island City, N. Y., wrote recently: "In our fleet of 128 Ford Trucks, 36 are over 10 years old, and 6 are 1932 models—14 years old! Their reliability and economy have given us good reason to be thankful that Ford Trucks Last Longer."

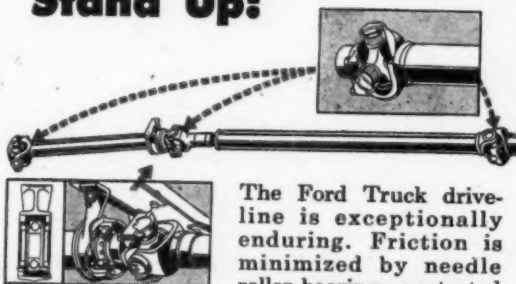
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Tens of thousands of Ford Trucks have proved their endurance in the tough service of handling bulk building materials, ores, earth and coal. This 2-ton Dump Truck chassis carries a 3- to 4-yard heavy duty body and hoist by St. Paul Hydraulic Hoist Division of Gar Wood Industries, Minneapolis, Minnesota.

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Milwaukee Snow Blitzed!



Milwaukee Journal Photo

★ Complete traffic paralysis! Hundreds of miles of Milwaukee streets looked like this

An account of this city's January 29 blizzard—worst in nearly a quarter century—and an outline of its normally efficient plowing methods. Also several questions such storms pose for officials of Milwaukee and other Northern cities to ponder

By Harold J. McKeever
Editor, ROADS AND STREETS

BEGINNING at 10 A.M. January 29—it was a Wednesday—the 50-mile gale that was whipping through the gals' skirts in Milwaukee started bringing snow in earnest.

The weather report wasn't good, and Harry B. Nelson, superintendent of street sanitation, who along with the city's street construction and repair department is responsible for plowing and hauling snow, had to make a quick decision. Normally the city's plowing is done after 11 p.m. with much the same equipment employed daytimes on ash, rubbish and garbage collection. The crewmen were all out on their collection work, and most of them were dog-tired

from working the previous night on street sanding following a light early evening snowfall.

The official weather estimate added up to a good blow—maybe 5 or 6 inches of snow. So just before noon Nelson called his men off of necessary services and they began putting lighter blades out on plowing. The city's equipment, while mostly old, was convertible in a few hours' time. The crewmen worked for a while, but since most of them had been on duty 17 hours up to noon, bets were laid that the snow wouldn't be too heavy, and the men were ordered home to get 6 hours' rest and be ready for night plowing, beginning at 10 p.m. More plows were mounted during the afternoon and the equipment readied.

An Unforgettable Afternoon

What happened from early afternoon on is still fresh in the memories of three-quarters of a million people. Snowfall that eventually totaled 18 inches rode in on furious wind. By late-afternoon tens of thousands of cars and trucks were stuck in the deepening drifts, as the whole population headed simultaneously for home. Curb-parked cars were drifted in, and arterials all over the city were hopelessly blocked by stalled autos, trucks, buses and street cars, most of the autos being abandoned as their owners sought shelter. Drifts 10 to 15 ft. high made Milwaukee momentarily the ghost of a city that was.

The light plows, too, were soon stuck or blocked. Only 14 of the 95 plows sent out beginning at 10:00 p.m. got to their destinations. Most of the units were old (actually 1923 to 1928) or light equipment, still usable for ordinary circumstances, but no good in real trouble. The city's three rotary plows with hoods and a single heavy V-plow tackled drifts but were hampered by parked or abandoned vehicles. The plan was to first take one cut along each arterial street. This sentence refers to loading and hauling and not to opening of a lane.

The real seriousness of the city's sudden predicament was realized when one fire station phoned the news that the trucks couldn't even get out of the garage! After this news the wires went dead. Superintendent Nelson started on foot to a garage five blocks away. The wind then was ranging from 35 to 56 mph. Once in a car he made a try for the city hall 3½ miles away, making the distance in 1½ hours and arriving at 12:30 a.m.

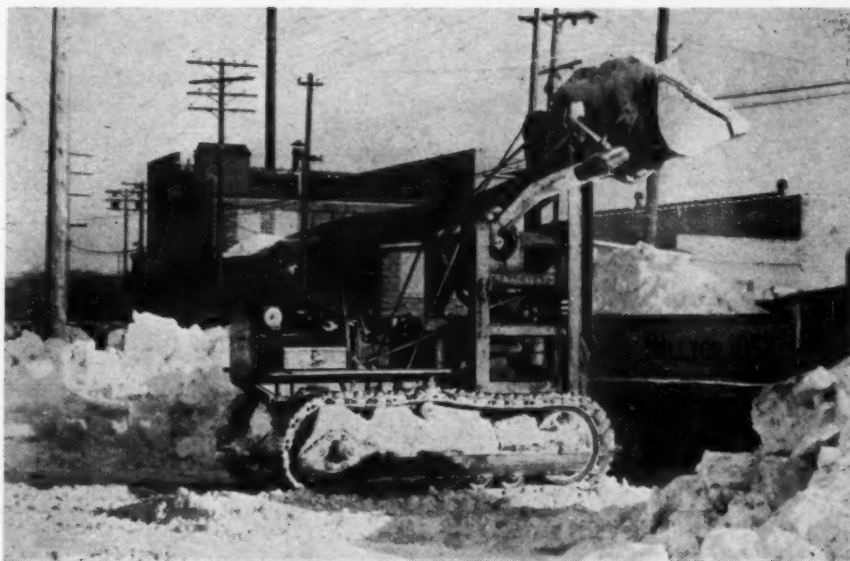
Handled Emergency Calls

During the night and in fact for another day virtually no snow clearing was possible. Every musterable piece of equipment was used to lead police ambulances in servicing hospital and other emergency calls. For example, the gas plant had to have coal, and the delivery route got priority. All emergency phone calls were double checked through physicians or ambulances to eliminate unnecessary effort.

Then commissioner of public works, Walter M. Swietlek, immediately took steps to locate and rent all available bulldozers, tractors, V-plows, loaders, trucks and trailers, calling on equipment distributors and the many equipment manufacturers whose plants are in Milwaukee. About 337 pieces were thus acquired. These units proceeded first to open up fire lanes and main transportation lines, following a sequence long established.

From Wednesday noon through Friday most of the city's street staff got only four hours of sleep per night, and Nelson's office staff put in 62 hours of almost continuous duty, getting snatches of sleep in the office. Many of the drivers, operators and laborers worked 50 hours in a stretch, and the general response and morale was wonderful.

Meanwhile the city recruited all available labor. As men were hired they were instructed to go to the nearest ward yard, where they were



Acme Photo

★ Another type of heavy-duty loader pressed into service in Milwaukee

handed shovels from regular city stock or from an extra stock of 1200 shovels purchased from local hardware wholesalers. Many miles of arterial streets were literally opened up by hand, so that stalled vehicles one by one could be moved out of the way of motorized plowing equipment.

3400 Hand Shovelers

Shovelers were paid \$1.17 per hour. The regular force of 700 was swelled to 4000 maximum. Little by little the normal city-wide plan of plowing began to function, and by Friday Mr. Nelson was able to drive his car 3½ miles back to his home. But it was Monday before most of the transportation lanes and services were open. Nelson's administrative force was on duty 16 to 20 hours a day for 18 days. Below-zero cold came on the

heels of the storm and three weeks later frozen snow was still piled high in the gutters.

Snow Hauling Began

Snow hauling in Milwaukee is handled by the department of street construction and repairs, under superintendent Raleigh Gamble. His office supplied interesting supplementary data, including a reminder of the almost unbelievable tonnage represented in the average metropolitan snow removal job. It was calculated that 5¼ million cu. yd. of snow fell on Milwaukee's arterial streets and transit lanes. As a separate operation from superintendent Nelson's department, but all under the commissioner of public works, Mr. Gamble's department set up operation with three rotary units and dump

★ Modern loaders and other units rented from local distributors and manufacturers aided in digging out.

Milwaukee Journal Photo





Milwaukee Journal Photo

★ V-plows worked ahead of the pick-up rotaries to break up banks

trucks beginning work on the fourth morning after the storm. All snow picked up in the central business district was dumped into the Milwaukee River which traverses the downtown area. Disposal from downtown proved to be the bottleneck once main transit lines had been laned through. Side-dump trailers disposed at the garbage plant. Side-dumps and end-dump trucks, used to a 300-ft.-long riverside dumping apron, also dumped from other docks. A large tonnage was dumped off one leaf of a bascule bridge, the other leaf being held at raised position for this purpose and the structure closed to traffic. Holes were cut in the floors of other bridges.

15,000 C.Y. Daily

About 20 trucks ranging from 5 to 16 yd. were used for each rotary, the units working two 10-hour shifts per day with a 2-hour layover between shifts for servicing of equipment. This fleet averaged 500 short-haul loads or 2500 c.y. per shift per rotary, or about 15,000 c.y. per day total.

V-plows when available were used ahead of the rotaries to break up banks, and a blade of some kind followed for cleaning up.

End loaders of new powerful design were among the units rented or purchased and this type of equipment was concentrated at intersections, cross-walks and parking areas. Scari-fying equipment came into play later in removing ice from pavements.

This foregoing account version was given to the **ROADS AND STREETS** editor by superintendents Nelson and Gamble and staff, who along with the rest of the city administration were under severe fire by newspapers and citizens for letting the storm get out of hand.

We have read these criticisms, which are typical of the people of any city in times of emergency or disaster. Editorializing for a moment, there is

no doubt that Milwaukee, along with most other large American cities in the snow belt, is badly in need of more and better snow-fighting equipment, and that the nice point of judgment is how much money should justifiably be invested in the heavy-duty special units so sorely needed during occasional big storms. The equipment need is a chronic one going back many years.

After the storm had abated the city council met and gave the commissioner of public works extraordinary powers to seek the immediate purchase of 50 new units of snow plowing and removal equipment, all-wheel-drive trucks and lighter all-purpose trucks totaling \$530,000. The red tape of formal bids and purchase contract was dispensed with where new equipment meeting requirements could be obtained at once.

Three Big Problems

In commenting on this storm, superintendent Nelson posed several serious questions, and outlined clear-cut "musts" if future storms are to be battled more effectively.

Most serious question: What are the legal rights and also liability of a car owner when he abandons his

car in the path of traffic? Many cars in this storm were abandoned, and even the doors locked, some left for as long as eight days. There were cases of out-of-town owners who blithely went to their distant homes and left their cars to be towed away. There is no ordinance in Milwaukee—or in most other cities, either—that clearly defines the rights of all concerned. Can the city be sued if it damages a car while towing it? Can the owner be sued for causing obstruction? It is understood that Milwaukee is planning to protect itself against damage claims.

Question No. 2 is what to do about cars parked at the curb. This question resolves itself into two parts. The first part covers the period during which the snow is being plowed from the center of the street to the sides of the street. If cars are parked near the curb at this time, the plows would force the snow up against these parked cars and cause them to be stuck or buried in the banks of snow created by the plowing. The other part of this question covers the period during which snow is loaded from the sides of the streets onto trucks and hauled away to the dump. If cars are parked in front of the banks of snow that are to be removed, the snow removal equipment is unable to get to the snow to be loaded. The practice in the City of Milwaukee in connection with this difficulty has been to have crews place "No Parking" signs on the snow banks, as far ahead of the machines as possible, in order to warn motorists that snow loading operations were to be carried on in that particular locality during the following few hours. In addition, two traffic officers accompany each crew, tagging illegally parked cars and expediting removal of cars after making every possible effort to locate the owners. Strict enforcement of all-night parking helps normally, but



★ Another type of heavy-duty hydraulically operated loader, pressed into service in yards and at crosswalks and intersections

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the January 29th storm hit during a business day.

Question No. 3 is equipment. As noted, Milwaukee has already taken steps to build up its fleet and retire ancient units. Superintendent Nelson's goal is to be able to put 40 heavy-duty snow plowing units on the

streets within one hour. This aim requires heavy expenditures. But with careful selection of truck units having year-around usefulness and ready convertibility, the investment should be a doubly profitable one. (The above equipment approved after the storm has been purchased as of this date.)

Milwaukee's Normal Snow Plowing Plan

The following summary of Milwaukee's normal plowing methods—ordinarily quite successful and representing long experience—was supplied in a report by Harry B. Nelson, superintendent of street sanitation.

The bureau of street sanitation has two systems of plowing snow for the

entire city, the district system and the ward system. Owing to traffic congestion and the use of all equipment by ash, rubbish and garbage collection operations, it has been found desirable to start the plowing of streets at 11:00 p.m. This time was arrived at for the following reasons:



★ Heavy dozers and trailbuilders successfully carved out several main arterials. Most of these were units supplied by local factories from equipment awaiting shipment

★ Most of the light one-way plows sent out during the height of the storm never reached destination. Later on they performed the bulk of the clearing

Milwaukee Journal Photo



1. Between 5 and 6 hours is necessary to convert all equipment from ash, rubbish and garbage collection to snowplowing. The trucks arrive at the garage between 4 and 5 p.m., after being used in ash and rubbish collection.

2. In specifying a certain hour, all personnel can be alerted and the entire force go into action at the same time.

3. Broadcasting stations are notified and announce the plowing of snow on their news broadcasts, asking the motorists to get cars off the street.

4. Owing to downtown parking, it has been necessary to delay plowing downtown streets to 1:00 a.m., for an ordinary snowstorm.

District System Plowing

The City has been laid out into 27 snowplowing districts, with no regard to ward lines. There are 3 general supervisors and 9 district supervisors used to supervise the field activity. Each supervisor works 8 hours and is then relieved by another supervisor. Each one must turn over to his relief man all snow routes and such information as his successor may need. Before leaving work he must report to Snow Headquarters at the City Hall. Each field man is assigned 3 snow districts to supervise. Routes and maps of each district are in the possession of the supervisor. Two snowplows with blades working in tandem are assigned to each district, starting at the top of each snow route and continuing to the bottom of the list. The downtown district No. 1 will be assigned 16 plows. This area should be cleaned in not to exceed 6 hours. Plows are then assigned to other districts. Each field man must report to his headquarters the progress made in his district every 1½ to 2 hours, stating how far down on the route sheet plowing has been completed. The name of the operator and equipment number working in each district must be reported. Every field man must report any delay caused by breakdown of plow or truck, truck out of gasoline or held up by street cars, truck sent to garage for repairs, etc. In all instances the time and length of the delay are reported.

Ward System

The Ward System was only an experiment and operates on the same principle as the District System, except that the supervision is by the Ward Foremen instead of the District Supervisors.

Raising Sunken Bridge Spans With Chain Hoists

IN the summer of 1946, flood waters of Coal Creek, Fountain County, Indiana, undermined the upstream end of a concrete pier, causing that end of the bridge pier to settle about 30 in. to solid footing. This left the two adjacent bridge spans at such an angle that county road authorities found it necessary to condemn the bridge.

After consultation with two bridge contractors, it was deemed impractical to raise the bridge by the old screw-jack method of cribbing up from underneath, because of the constant danger of freshets washing away the cribbing and allowing the bridge to topple.

Under normal conditions, the failed pier stands in some 6 ft. of water. It was estimated that to remove the bridge and replace the pier would cost the county some \$40,000. However, two residents of the county, Homer and J. D. Coffing, conceived a method of doing the job with the aid of two 15-ton and two 6-ton capacity chain hoists, of a type pictured in the accompanying photo. This new method consisted of placing the cribbing on top of the tilted pier instead of underneath the bridge. Enough of the flooring was removed to allow cribbing up 7½ ft. on both the inside and outside of the span girders as shown in the illustration.

The two 15-ton capacity hoists were then suspended from the cribbing and attached to the ends of the 125-ft. spans. The hoists were operated simultaneously, thus keeping the entire bridge structure in balance at all times while raising the spans. The two 6-ton hoists were attached to shore anchors some 200 ft. from the bridge, with cables running to the top of the bridge structure to permit pulling the top of the frame structure back into alignment at the same time the bridge was being raised.

After the bridge spans had been raised some 31 in., two 16-in. steel I-beams 5 ft. long were placed crosswise on the pier where the spans formerly rested. The I-beams were placed 24 in. apart, and after tying across ends with 1-in. bolts, headers were placed at each end of the I-beams and the section between I-beams was filled with concrete. Two layers of additional 6-in. I-beams were then placed crosswise under each span

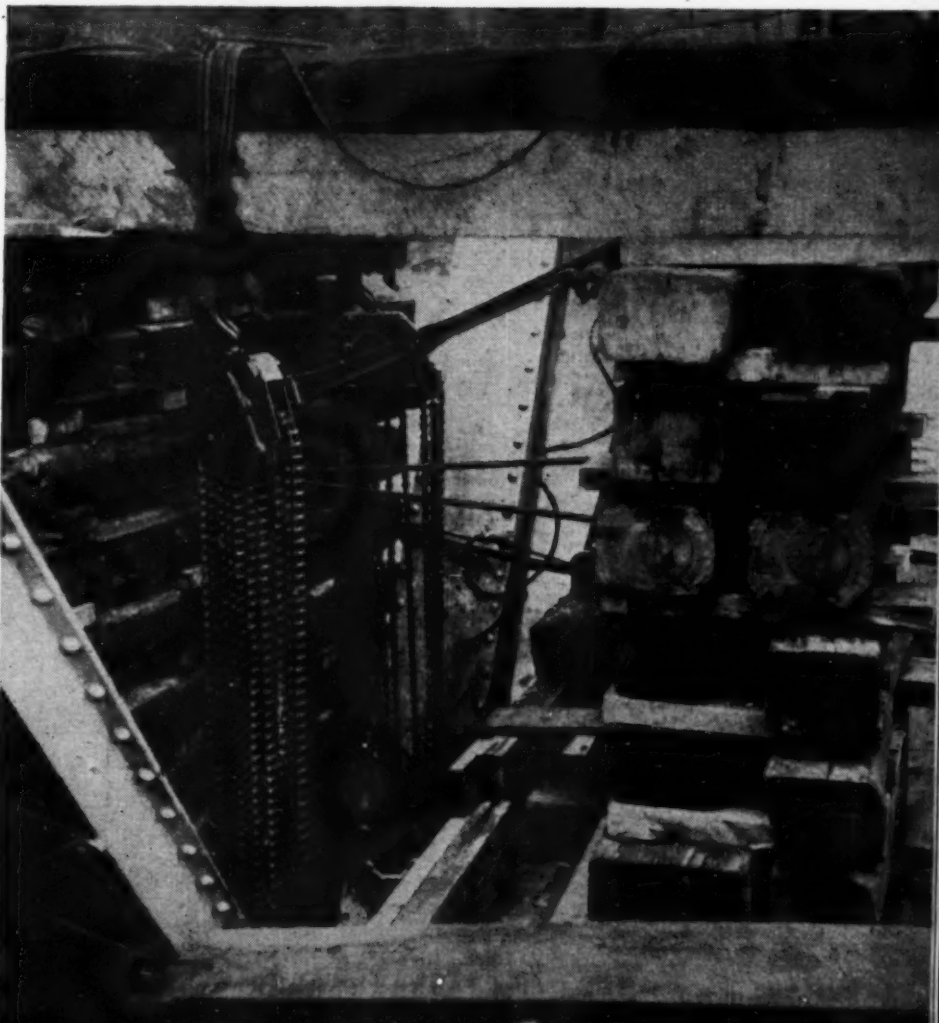
base and ½-in. sheet steel was added to build the pier section up to 30 in. The rollers were then placed under each span on 1-in. sheet steel.

In the near future when weather conditions permit, a concrete and steel form will be built around the blocking and across the pier in order to give additional support.

Some of the many advantages in raising the bridge by this method were:

1. The entire cost of the job was less than \$1,000, which included filling around the bottom of the pier to prevent further washing.
2. The job was done by six men in less than two days, including straightening the entire bridge frame.
3. Because they were always working on top of the bridge, it was less dangerous to the men on the job and much heavy labor was saved.

★ How two 15-ton chain hoists were utilized to raise the spans. Hoists were suspended from timbers supported on cribbing built on top of the sunken pier. Hoists were of type manufactured by Coffing Hoist Company, Danville, Ill.



★ Completed job—Note position of sunken pier and use of I-beams and sheet steel to build up seat to original level

4. The bridge was balanced at all times so that there was no possible danger of it toppling over.

Home-made signs erected by individuals along New York state highways to indicate places used for cattle crossings will soon be on their way out. Uniform "Cattle Crossing" signs are being prepared by the State to replace those now posted by individual farmers.



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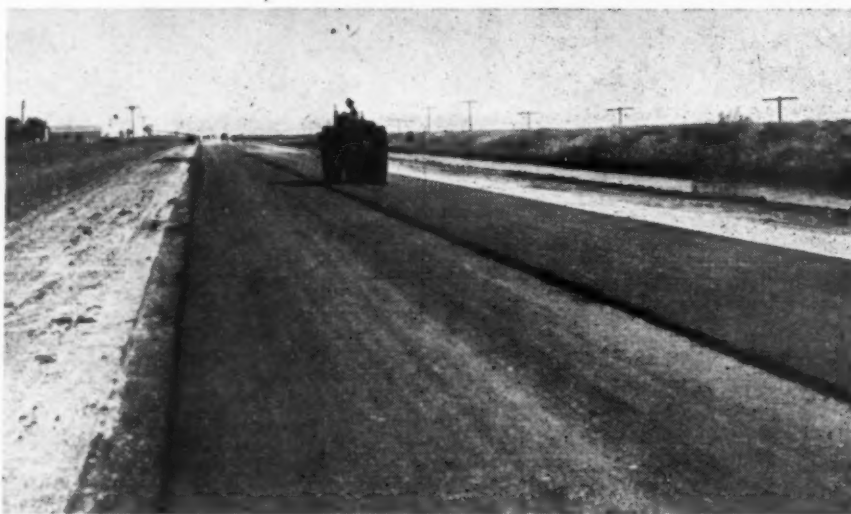
Brown & Root's Sand-Shell Hot-Mix Job, Texas Route 146 Near Galveston

Contractors at Work

SAND-SHELL is a familiar mixture in many parts of the South for flexible base. But not seen every day is the use of the same sand-shell aggregate in a road-mix base and a hot-mix bituminous surface.

An example of this latter combination—possibly its first use on a highway—was the reconstruction of a state road down in the oil refinery territory between La Porte and Galveston, Texas. To describe the job in a nut-shell, the old shell base and asphalt surface were scarified, blade-mixed and spread out to a new cross-section. Shell with a small percentage of sand was rolled to form a 6-in. subbase. Then three courses of sand-shell hot-mix were put down, consisting of two binder courses and one surface course totaling about 5 in. of thickness. The mix was the same for all courses except smaller maximum size surface course.

A sand-shell base like any other base must be supervised by someone experienced with the materials being used and sensitive to the small changes that affect density and other qualities sought. The first step here



★ Placing surface course of sand-shell. A 94% laboratory density was obtained

was to spread the old loosened sand-shell flexible base material out to a width of 28 ft., giving about 2 in. depth of material.

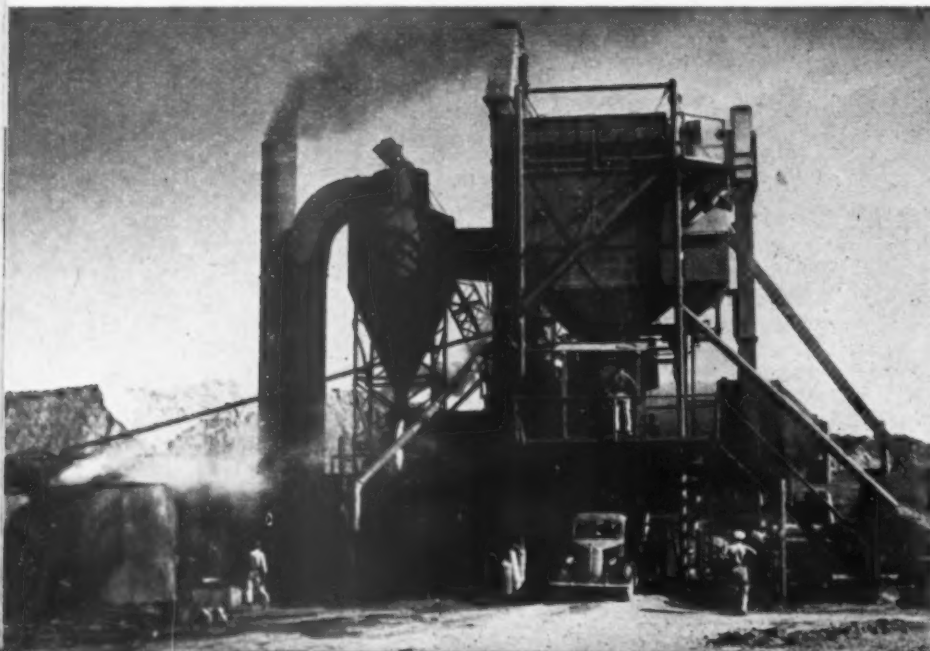
Enough new sand-shell material was then added to bring the rolled thickness up to 8 in. Material was

tailgated from trucks and rolled in two courses, shell being windrowed, then sand brought in and the materials blade mixed.

Moisture content of the material was carefully watched. On days following rains roadway and imported material were aerated with a disc harrow. When the weather was too dry, the harrow was again needed to loosen and break up the clods that were formed under traffic.

The base mixture consisted of about 25% to 35% soil binder and had a P.I. of about 6.

Mixing was performed by cutting out to the edges with motor graders, piling roadway material and again spreading it out to the roadway edge, taking care each time to cut down



★ Brown & Root's asphalt plant as set up for the Route 146 job in Galveston County, Texas. Note 100-ton oversize dryer. Three diesel power plants operated the outfit. Boiler fed water from a 650-ft. well was pumped, using the motor from a large portable air compressor for power

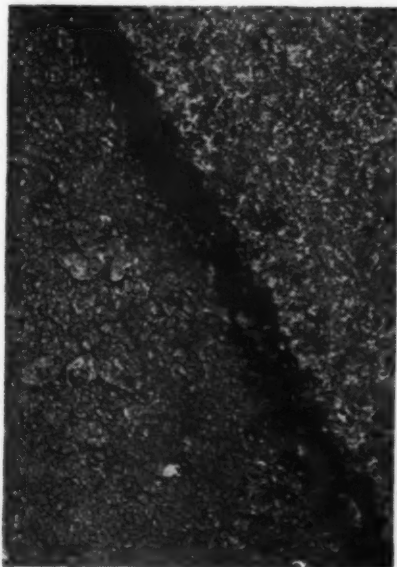
to the grade. Material was stacked and spread three to five times in order to get the desired uniformity.

Then the grader operator started his final spread, placing the outer 10 ft. lane in 1 to 2 in. loose lifts, followed immediately by sprinkling and rolling with a pneumatic roller. The 6 in. layer was thus compacted in thin lifts.

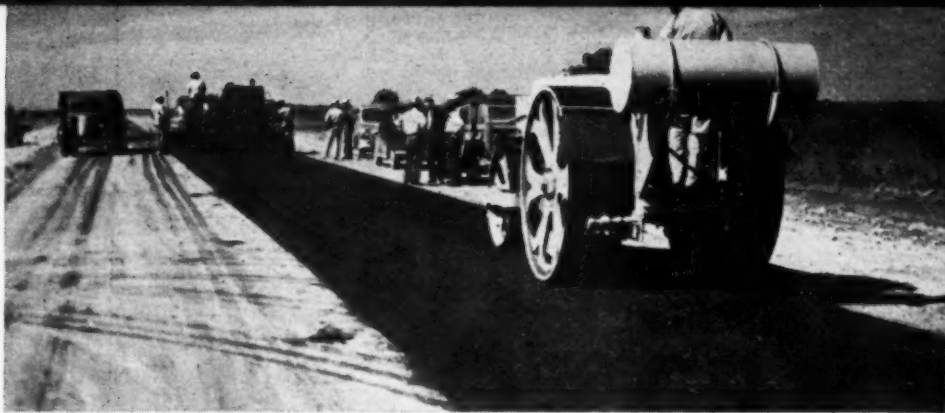
Having compacted a 10-ft. side strip, the blade man next cut out the middle third of his work section, windrowed the material on top of the compacted strip, and then brought it back in 2-in. lifts. The remaining 10-ft. strip was similarly completed.

All work was performed under traffic, and traffic used the base for varying periods before the surface could be laid. Rain often delayed hot-mix placement, in which case extensive touching up was necessary. No attempt was made to bring the base to "polished" grade until just prior to starting with the hot-mix. The base was lightly scratched with the scarifier to catch potholes and ruts, and the top material again bladed and consolidated with a pneumatic roller, this time also using a steel roller. After the base dried for a brief period, it was cleaned with a tow-type rotary broom and shot with .2 gal. per sq. yd. of MC 1 primer. Drying out of the base was considered a critical requirement, and frequently priming was delayed 4 to 7 days for this reason. Sometimes an additional bituminous application was considered necessary.

The surface consisted of a 290-lb. application of base or binder course laid in two courses, and 130 lb. of surface course material, giving a combined thickness of about 5 in.



★ Close-up showing edge of rolled surface course overlying binder course. Note coarse textured appearance caused by the shell



★ The binder course of sand and shell was placed like any other hot-mix materials

The base mix aggregate was specified "2½-in. down" and the topping mix passing ¾ in. Actually 90% of the leveling mix material passed 1 in.

The material was processed in a modern 65-t.-per-hr. hot-mix plant erected at a barge slip along the job. The plant included a 5000-lb. weigh box, but batches were limited to 3500 lb. due to the use of shell and a double watch was set on mix density. 85-100 pen. asphaltic cement was used.

A feature of the plant was the use of the "biggest dryer in Texas"—a 100-t.-per-hr. capacity unit, substituted for the usual 65 or 75 ton dryer. It seems that drying shell is quite a task for several reasons. It arrives by barge usually wet. Minute air pockets in the shell must be dried out. This is just one of the reasons that experienced field engineers in the Houston area consider each mix material (shell, iron-ore-gravel, sand, etc.) a special problem calling for special handling. From this plant the Brown & Root crew laid 2500 to 3000 ft. of single course per day, full roadway width.

The highway department considers the use of shell in a topping mix as experimental. Laboratory density of 94% was obtained. The subgrade, incidentally, frequently measured 100 to 105 Proctor where traffic densification under the old road wasn't disturbed. Getting an economical road for the growing traffic in this tideland area has been no simple matter. The area traversed by the above de-



★ Fred Hall, Supt. for Brown & Root; L. H. Durst, of B & R; Harold McKeever, of "Roads and Streets"; Cooper Dewey, Res. Engr., Texas Highway Department

scribed project is only 5 to 10 ft. above sea level. Rainfall averages about 50 in. annually, but 60 in. fell during the first 9 months of 1946, seriously retarding and complicating this project, so that it wasn't completed until February of this year. The top 12 to 15 in. of soil is a silty clay with a P.I. of 20 to 30, and underlying this is a yellow clay with a P.I. around 45.

This project of 11.6 miles cost \$439,000, including engineering, or about \$38,000 per mile for base and surfacing 28 ft. wide, which under prevailing price conditions was deemed satisfactory for a road designed to carry 2000 or more vehicles daily of highly industrialized traffic under the conditions noted.

The project was directed by the Houston district of the Texas Highway Department, Jim Douglas, District engineer and Cooper Dewey, resident engineer.



★ Manipulating sand-shell materials for base construction

Compaction of Soils

An excellent review of some fundamentals, with special reference to types of rollers and the best use of pneumatic-tired equipment

By A. O. Williamson

Wm. Bros Boiler and Manufacturing
Company, Minneapolis, Minn.

MUCH progress has been made during the last decade in compaction, stabilization, and moisture control of soils. Specific formulae have evolved from laboratory and field testing plants so that now proper blending of soils and methods of application can be made on a scientific basis.

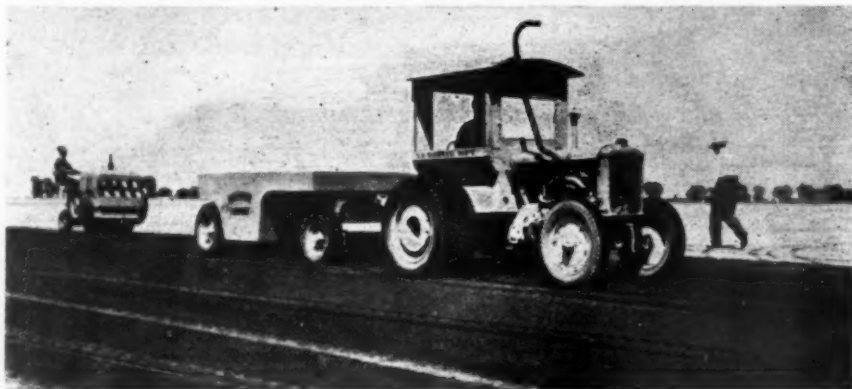
In airport and highway construction the fundamental pre-determined load, before the actual construction is under way, is the maximum traffic wheel load, both impact and frequency. This wheel load will also determine the type and depth of surface pavement after the soil supporting value has been obtained. The subgrade compaction must reach a density that will carry the imposed load without volume change of movement. This means that the most important part in the construction of an airport runway or highway is the soil substructure and its compaction. It is so important that engineers feel that before long every road and runway will be of "fill-type" construction. "Fill-type" construction gives control of all blending of materials and their proper compaction.

Value of Cohesion

In order to understand the varied

details of soil compaction, it is perhaps best to delve slightly into the inherent characteristics of cohesion. Cohesion is that "bull-dog tenacity" of one soil particle for another. A dry clod of dirt best describes it. From appearance, all moisture may be gone, yet it usually takes a sharp blow to shatter it. The minute film of moisture surrounding a soil particle, even when apparently dry, is the "backbone" on which soil stability rests. This film appears to have odd characteristics. While appearing like water, it is non-lubricating, has a higher boiling point, and lower freeze point than water. However, in order to use this cohesion to its maximum advantage in soil compaction, it becomes neces-

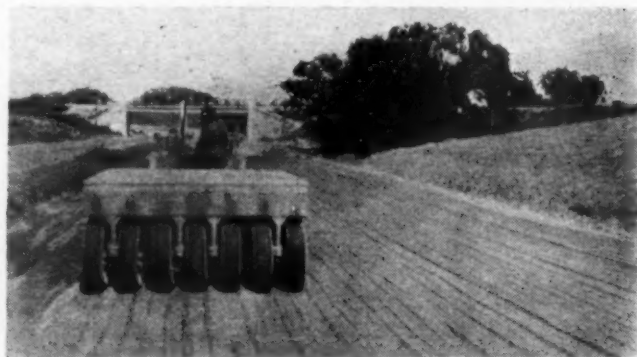
sary to add or remove a certain amount of moisture. This produces a slight extra film for lubrication, so that the soil particles slip around one another and find their proper position when put under compaction. The result of this process is known as the optimum moisture content. Each type of soil in correlation with the compaction equipment being employed has its proper optimum moisture content which will result, under compaction, in maximum density and consequently maximum stability. However, laboratory control and methods are hard to duplicate in field practice and it has been found that in the majority of soils, the most efficient compaction is reached with-



★ Airport runways require high compaction. This scene was taken at the Fargo, N. D., airport, where a pneumatic-tired roller is working on a resurfacing job



★ In road work, the pneumatic-tired roller meets a variety of demands. On bituminous mats, for instance, it forms a surface that is uniform, coarse-grained and resilient



★ Highway fill rolling with the Wobble Wheel Roller. Note the surface evenness showing that voids are being removed



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in the range from 75 to 100% of the optimum. Theoretically, it would be best to begin compaction operations at a moisture content slightly below the optimum and continue until maximum density is obtained. Most soils, however, are not in their best "molding" form when even slightly over optimum moisture content. Silt soils have a tendency to become elastic and spongy, clays become gummy, granular soils tend towards lateral displacement under compaction loads.

The Three Essentials

Since the sole aim of compactive work is the attainment of the desired stability, the following three steps have proven the most practical:

(1) Accurate determination of the optimum moisture point.

(2) Rigid field control over moisture content.

(3) Field control of compactive efforts.

By compacting a soil mass at its optimum moisture content, maximum density is obtained during construction, thus insuring a stable foundation on which to build surface pavement. However, at this point, it may be well to illustrate a field moisture control job as an example to show variances. The soil placed and compacted on an embankment was found to contain 16.8% moisture, while the optimum was 19.3%. Although this content was considerably less than the optimum percentage of moisture, it was compacted by the normal passes of a sheepsfoot roller to a density of 127 lb. per cu. ft. The maximum density for this particular material was 128 lb.; consequently, it was compacted to 99.2% of its maximum density, which would be considered satisfactory.

Along with proper control and compaction must also go proper selection of soils. Since maximum stability occurs with soils having a high maximum dry weight per unit volume, the selection becomes one of importance. Soil selection may even justify relocation of the construction project.

How Compaction Is Produced

With today's knowledge of soil types and their behaviors, proper methods of compaction can be projected. Three basic methods have been acknowledged. (1) Weight, (2) Vibration, (3) Kneading. All three methods are closely related. Weight takes in most types of heavy rollers, such as tamping or sheepsfoot, all steel drums and discs. Vibration can be a result of weight, but is more often thought of as a result from a

(Continued on page 121)

The Month's Picture Page →

(An Editorial)

THE photos on the page opposite, taken April 2, this year, add up to a reminder that better farm-to-market roads are still one of our great national needs. We have only begun.

Back in the thirties much was written and said about the "low cost road." Stabilization was a word on every tongue in highway circles. A big start was made in placing a greater emphasis on the land roads and feeder roads that stream into our primary system; and learning and teaching the way to better drainage, compaction, soil correction, stabilization and other vital phases.

Then came the war, and cessation of all but vital or strategic highway construction which usually meant main roads. Farm road betterment marked time.

The Federal Highway Act of 1944 put the secondary road back in the spotlight, by allocating some of Uncle Sam's money for such roads—also by forcing the selection of a priority system, calling for speedy evolution of new minimum design and construction standards for such roads, and by requiring assurance of proper subsequent maintenance.

Most states have made good progress in getting the federal-secondary programs into action. Texas is one—a leader. The upper view on the opposite page shows one of Texas' recent Federal-aid secondary projects, base built and ready for topping. Its cost, including an all-weather mat—around seven thousand dollars a mile—seems high for a road that carries only about four hundred vehicles a day. But remember, these are days of high cost for all commodities—and also of very high dollar penalties for the lack of good highways.

Building up the federal-aid secondary system will take years. Meanwhile what of local roads the Federal-aid program misses?

The lower picture, taken the same day, is of an adjoining county road

in east Texas. It is typical of hundreds of miles of Texas county roads that either have never been improved adequately; or which have been allowed to lapse after pouring money into betterment, due to lack of engineering supervision or even ordinary maintenance.

This particular road was once a good bituminous road. But it got away. Systematic maintenance could have preserved this road and many others like it for many years, at a fraction of the money that now must be dug up to scarify the pitiful remains and begin over.

How will we get the better farm roads we need? *Not just through "lifting them out of the mud," but through lifting them further out of the neglect that is so often still inherent in the local political system. Blighting ignorance, indifference and lethargy still hold down local highway progress in some states.*

Where Praise Is Due

We've seen county engineering rise to a high professional level in many states, and this applies to individual counties in other states where the blight of the old system still generally prevails. Let us be grateful for the outstanding individual county leaders, the strong state-wide county road associations, the state-county cooperative committees, the college short courses.

We've also seen great strides in the past decade toward vitalizing county highway engineering through national group action. Good luck to the ARBA's County Officials Division with its Institute of Local Highway Administration, and other organizations who today are cooperating with federal, state and local authorities to create a better deal for local roads. We have the technology. The big task is better legislation, better administration.



★ Here's what a farm-to-market road can be like—and how thousands of miles of local and secondary roads still look today. See adjoining page for detailed comment. Wear and tear on vehicles alone costs road users along bad roads more than they'd have to pay for a properly drained, cross-sectioned, all-weather road properly maintained. "You pay for good roads whether you have them or not"



LETTERS AND COMMENTS

More on Professional Engineer Registration

To the Editor:

Arthur Heiberg, Treasurer of our Akron Chapter, had Mr. Glidden's editorial "Why a Professional Engineer Classification" (January "Roads and Streets") called to his attention. He, in turn, requested that I write to you and call to your attention the fact that your criticism does not apply in Ohio.

We have about 15,000 registered engineers and surveyors in Ohio, almost 15% of the U. S. total. Ohio's is the largest of the State Societies in the National Society of Professional Engineers, with over 3400 membership.

Much of your editorial is devoted to the unfairness of asking men to pass an examination on technical subjects long after they have graduated from college. This is not and never was the case in Ohio. From 1933 when the Registration Act was passed until Dec. 31, 1946, all engineering college graduates could obtain registration by exemption from the examinations. The Engineer-in-Training was created by law then and with it the privilege of taking the examination at the time of graduation.

The Ohio Society spent thousands of dollars and printed tens of thousands of circular letters and pamphlets telling college graduates of the deadline for obtaining registration by exemption from the examination. Over 7,000 men applied during 1945 due to our publicity. The Engineer-in-Training program is fast taking form in many states and although your criticism may apply in specific cases you will find that in many instances the applicant is at fault for *delaying his application. I have no doubt but that this is true in most States.*

The editorial stated that "Engineering is no different from the other professions and, like medicine or law, is becoming more specialized every day." In the other two professions mentioned an examination is required. The profession of Engineering also wants to put its stamp of approval on college graduates. In Ohio when we do this it is done in two examinations as you suggest, one covering general subjects and one covering the specific branch. We

propose to eliminate branch registration but not for the purpose of qualification and examination.

In Ohio we are striving toward registration of all who practice engineering including the Federal employees, many of whom are now registered in Ohio. Public opinion brings such things to pass and we are creating it in Ohio.

—Lloyd A. Chacey, Executive Secretary, Ohio Society of Professional Engineers, Columbus 15, Ohio

Mr. Glidden,
Contributing Editor:

I have recently read, with great interest, your editorial "Why a Professional Engineer Classification." The points you make direct attention to the alarming inconsistencies in many registration laws, particularly in respect to the licensing of graduates of accredited engineering schools. It seems to me that to require such a graduate to pass a state conducted examination on the theoretical aspects of his special branch of engineering is a reflection on both the ability and integrity of the numerous professors and instructors who have qualified the graduate after four or five years of hard, intensive learning. I believe that if a college or university is excellent enough to be on the accredited list, certainly the graduates thereof should be sufficiently qualified in the basic knowledge of engineering and the specialized knowledge of the branch in which the degree is awarded.

The question of qualified engineers on the practical application of their admitted fundamental knowledge is, of course, worthy of consideration. However, here too, I believe that the examination requirement could safely be discarded, for surely the young engineers are never given positions of responsibility until they have satisfactorily demonstrated their practical ability to their employers.

On the other hand, I concur that the non-graduate should be required to pass examinations on both the theoretical and the practical aspects of his particular branch of engineering, for otherwise there is obviously no way in which he can be adequately qualified.

The program you present constitutes an excellent platform for the reform of state regulations governing registration. The registration act of my own state (Ohio) contains precisely the faults you have outlined and we are endeavoring to work toward the changes you have advocated. I trust the time will come when there will be uniform nationwide legislation governing the engineering profession in a reasonable and equitable manner.

—H. H. Kranz, City Engineer, Cincinnati, Ohio

Fellowships in Traffic Engineering

Ten fellowships in traffic engineering at the Bureau of Highway Traffic, Yale University, New Haven, Conn., are available for the next academic year beginning Sept. 22. They provide a living stipend of \$800 and include a \$400 tuition fee, plus a maximum of \$200 for an individual research project. Full information on the fellowships and the qualifications of candidates may be obtained from Bureau of Highway Traffic, Yale University, Strathcona Hall, New Haven 11, Conn.

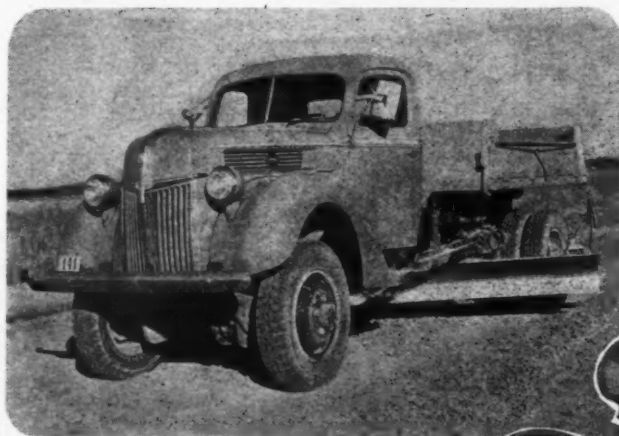
Mail Inserted Card or Inquiry Blank (page 132) for Equipment Data

Again this issue of *Roads and Streets* carries descriptions of many new labor-saving efficiency devices and latest material developments. See our New Equipment and Materials Section beginning on page 112, for which a numbered reply card has been inserted to help you request data on items that interest you. Also on page 132 is an inquiry blank and advertisers' index which will help you get data on equipment and materials you need.

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ALL·WHEEL·DRIVE

For All-Around, Year-Around Road and Street Work



Top: Marmon-Herrington Heavy-Duty All-Wheel-Drive Truck.

Bottom: Marmon-Herrington All-Wheel-Drive Converted Ford.

No hill too steep—no sand too deep—no going too rough and rugged . . . that's the story wherever you find Marmon-Herrington All-Wheel-Drive Trucks at work.

Marmon-Herrington All-Wheel-Drive Trucks, are "made to order" for road and street work. Here are trucks with virtually the tractive power of crawler tractors—yet many times as versatile and fast. Here are trucks you can depend on to carry men, materials, equipment—*where you want them, when you want them . . . swiftly, safely, surely.*

Marmon-Herrington Heavy-Duty All-Wheel-Drive Trucks are available in 4-wheel-drive and 6-wheel-drive models—rated gross capacities up to 42,000 lbs. Converted Fords are available in all standard models, both 4-wheel-drive and 6-wheel-drive—capacities up to 22,500 lbs.

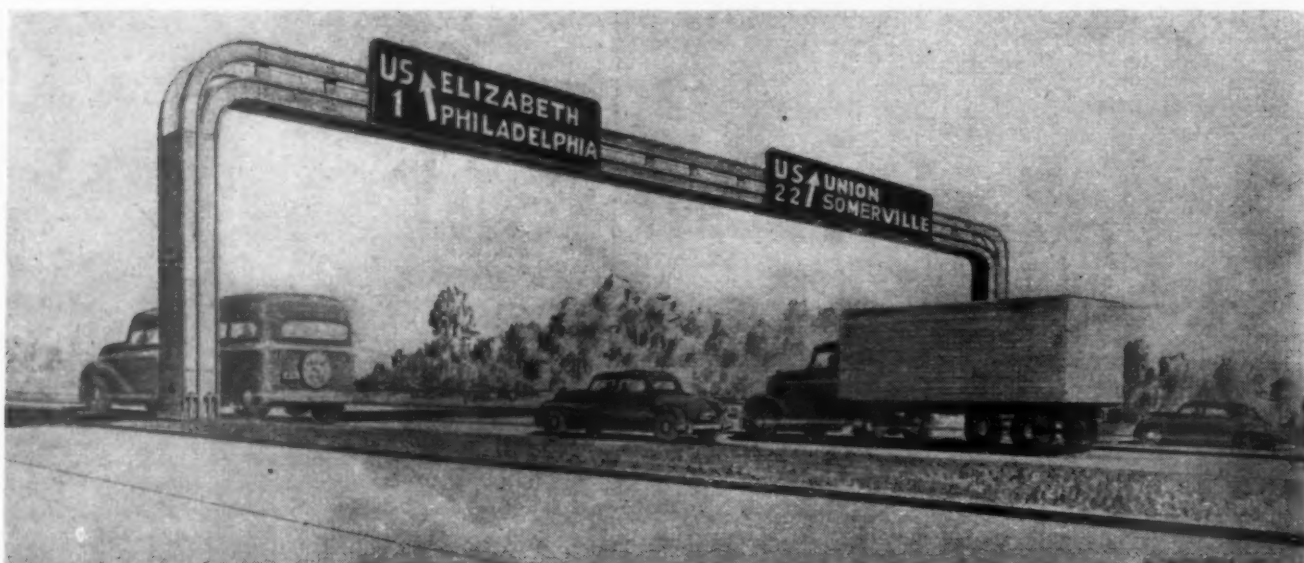
Discover how these great all-year, all-weather, all-purpose trucks speed operations, lower costs and increase profits. See your near-by Marmon-Herrington dealer, or write for literature.

MARMON-HERRINGTON COMPANY, INC.

INDIANAPOLIS 7, INDIANA



MARMON-HERRINGTON



Improved Signs For N. J.

By Ralph L. Fisher

Engineer of Design, New Jersey State Highway Department, Trenton

ROUTE 25 near Newark, New Jersey, has one of the world's greatest concentrations of traffic. About 16% of it consists of trucks.

This four-lane road is now being widened to eight lanes. Originally satisfactory for 36,000 vehicles a day,

it is having to carry an average of 60,000 and occasional holiday traffic over 100,000 daily.

Conventionally mounted signs along the side of the road are not effective for highways carrying high percentages of truck traffic. Large trucking

units create a problem of placing the signs where they can be seen from all points on the pavement. On dual highways the driver in the left hand lane may have difficulty seeing a sign (mounted in the usual manner back of the right hand curb line) due to traffic in the right hand lane blocking his view. When there is a mass movement of vehicles, the necessity of concentrating on driving may cause the motorist to miss signs not directly in his field of vision.

Angle of Vision

A motorist keeps his eyes focused on the road in front of him. The greater his speed the further in advance of his car are his eyes focused and the narrower his field of clear vision. The cone of clearest seeing is an angle of about 5 degrees on each side of the center of regard. Ten degrees may be considered the maximum desirable angle for reading a sign. This means that a motorist in the left lane should have finish-

Pictured Above one of several structures for neon-lighted signs to be erected on Route 25 near Newark, N. J., for advance warning to motorists. The 15-in. letters can be read at 750 ft. The structural steel bridges are to rest on pile-supported concrete footings. Not shown in the picture is a guardrail protection. The longest of five such bridge spans will be 80 ft. and the others will vary in accordance with width of roadway and importance of the junction.

The largest of the roadside signs on this route will be 24 ft. wide. In all, there will be about 70 road markers on this 3-mile, \$3,000,000 project and

27 will be illuminated.

Numerous tests disclosed that the life of the Neon tubes is longer when they are used continuously. Turning them on and off, it is explained, causes them to fail sooner from resultant oxidation at the terminals. For this reason they will remain lighted during the day. This schedule, however, will aid drivers since the tubes will be recessed in the letter channels for increased day and night visibility in contrast with a black background. Spacing was decided upon scientifically to obtain the greatest illumination from 360 incandescent light units to be placed along the three miles.

ed. reading a sign (mounted back of the curb line) while he is still over 200 ft. away from it.

The driver may see a small sign from a distance but if his eyes are focused ahead he will not see it when he is near enough to read it. If it should catch his attention, he must change the focus of his eyes from far to near vision. In addition, he must glance to the side of the road, read the sign and then refocus his eyes on the road.

What the motorist is to do should be apparent from a distance. Surprises and invitations to errors should be avoided. One of the most dangerous and annoying features of highway transportation is caused by traffic slowing down in the "through" lane before making a maneuver. To avoid this, signs must be large enough and so placed that traffic will not have to hesitate.

Advance Sorting Sought

For safe and expeditious operation, every effort should be made to get traffic sorted out in advance of an intersection. Ample weaving and merging distances are required. In addition, signing should allow for

reading time, perception-reaction time and deceleration time. In some cases this may call for advance warning signs.

A maze of small directional signs does not facilitate safe or uniform operating conditions. For directional signs New Jersey is establishing the policy of showing only two names (a) the nearest town and (b) a nearby important city of destination which the majority of the motorists are seeking. Letter height will vary in size from 8 to 18 in., depending on the particular site requirements. A new style state route marker has been adopted, using 8-in. numerals.

Route 25 Sign Bridges

On Route 25 it was decided that traffic could best be served at major intersections by placing the signs over the traffic lanes. These signs are mounted on sign bridges having 20 ft. vertical clearance. Even with this clearance (as shown on the chart), in order to see the sign, a driver 300 ft. from the sign would have to be over 150 ft. back of a high truck.

The letters are 15 in. high and are of the white neon channel type on a



★ Details of typical 18-in.-high neon sign. Note that letters are individually recessed

black background. It was recognized that maintenance of these signs would be a problem. The neon type of illumination was chosen because of the long life of the tubes. The channel type letter was used to prevent the spill of light from one letter interfering with legibility of adjacent letters. Tests have indicated that these signs have a legibility distance of 750 ft. for both night and day.

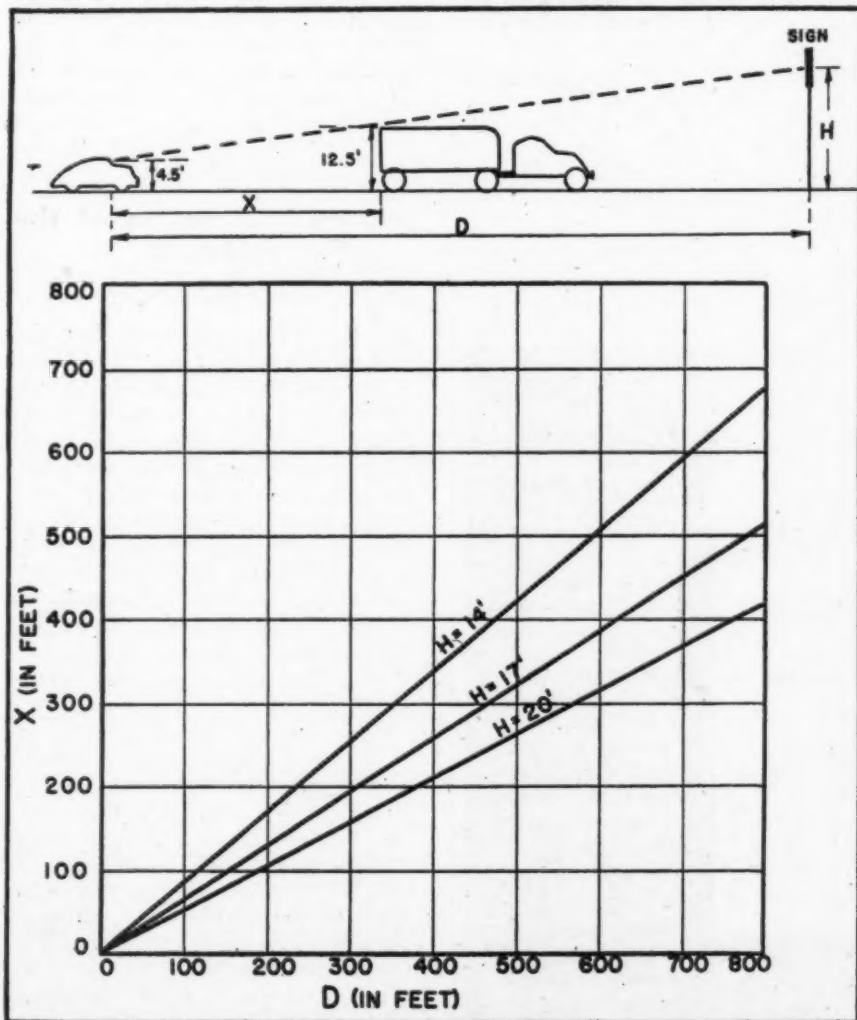
The slope of the arrows on the directional signs was governed by the sharpness of the turnout. For flat turns the arrow is nearly vertical and for sharper turns the arrow is more nearly horizontal. It was felt that when the motorist becomes accustomed to this it might help operating conditions. For psychological reasons when the turnout is to a lower level the arrow was pointed downward.

Maintenance Catwalk

Due to the high volumes of traffic it was believed that it would not be feasible to use conventional ladder trucks for maintenance purposes. A catwalk is constructed between the structural members of the sign bridge with access provided for from the side columns.

Special protection is to be given to the columns of the sign bridge to prevent the possibility of a large truck toppling the structure onto the live lanes of traffic. Between the standard curb and the column there will be a compression-type guard rail offset from the posts. To provide high visibility it is planned to use glass bead paint on the guard rail plates. The guard rail is carried for several sections beyond the anchor posts and lighter posts used at the end to present less of a hazard to a vehicle out of control.

Other proposed traffic aids on Route 25 include roadside delineators



★ Design chart used in determining visibility of signs and planning proper height, distance ahead, etc.

Steel forms BY

Heltzel

HEAVY-DUTY HIGHWAY AND AIRPORT FORMS The 7/32" form is recommended for all concrete slab construction up to 20' widths. The 1/4" form is recommended for slab widths over 20' widths.

HELTZEL LIP CURB FORMS Quickly and easily affixed to the road form by means of two swivel clamps.

HELTZEL HEADER FORMS Quickly and easily assembled by engaging the hook bolt beneath the flange on the tread of the road form.

HELTZEL INTEGRAL CURB FORMS A positive rigid form assembly for building curbs integrally with the road slab.

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HELTZEL STEEL CURB-and-GUTTER FORMS Sections are 10' long and two supports are furnished for each section.

RIGID RADIUS OR FLEXIBLE STEEL FORMS Available to match any specification.

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BINS, Portable and Stationary
CEMENT BINS, Portable and Stationary

CENTRAL MIXING PLANTS
BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)

BITUMINOUS PAVING FORMS
ROAD FORMS (with lip curb and integral curb attachments)

CURB FORMS

CURB AND GUTTER FORMS

SIDEWALK FORMS

SEWER AND TUNNEL FORMS

CONCRETE BUCKETS

SUBGRADE TESTERS

SUBGRADE PLANERS

TOOL BOXES

FINISHING TOOLS FOR CONCRETE ROADS

and traffic lines utilizing glass bead paint.

Acknowledgments

The sign bridges were designed by O. H. Ammann, Consulting Engineer, Boonton, N. J. and New York City. Steel fabrication and erection is being done by Selback and Meyer. A. Neri, Inc., is the electrical contractor and Hutchinson Signs, Inc. the electrical sign sub-contractor.

The sign foundations were installed by the State Highway Department under the supervision of A. W. Muir, Superintendent of the maintenance division. The non-electrical signs were made and erected under the supervision of Earl L. Storer of the maintenance department. Electrical work is under James L. Hays, acting head of the electrical division of the highway department. All highway design and plans are under Harold W. Giffin, engineer of survey and plans.

Chicago's parking restrictions in the congested downtown "loop" district have recently included a ban on trucks except those making bona fide deliveries to points within the area. Other trucks must detour around the area. Police have campaigned to enforce this restriction, which has notably eased congestion.

Important Function of the A.I.L.H.A.

(Continued from page 56)

highway legislation, programs and operations affecting the interests and welfare of local jurisdiction and its coordination in the general highway activities of the nation; to improve local road planning, financing and operation; and to cooperate with other national official organizations in the best interests of the several segments of the American highway system."

Local roads—their improvement, extension and maintenance—engage the attention, therefore, of serious-minded, far-sighted road builders today; and they come within the scope of the American Institute of Local Highway Administration. To bring about the proper state and federal cooperation in extending these very roads is one of the important tasks of the county highway official. He can do it better by knowing what other county officials are doing in his state and throughout the nation. This continuous distribution of timely information is one of the benefits offered by AILHA.

MEETS SCHEDULE

"with time to spare"...

The Model 424 Standard Steel Works Pressure Distributor heats and loads faster. With spray bar valves *inside* spray bar, circulation from end to end, even when folded, resulting in absolute uniform heating inside bar—as soon as the material is at application temperature, this spray bar is "ready to go".



THE FERRIS COMPANY
INCORPORATED
HAROLD, MICHIGAN

Gentlemen:

We feel that we used exceptionally good judgment when we purchased a Model 424 Standard Steel Works Distributor from you. On one job this machine applied approximately 600,000 gallons of Bituminous material without a delay or any trouble whatsoever. In fact, because of this Distributor we met our schedule with time to spare.

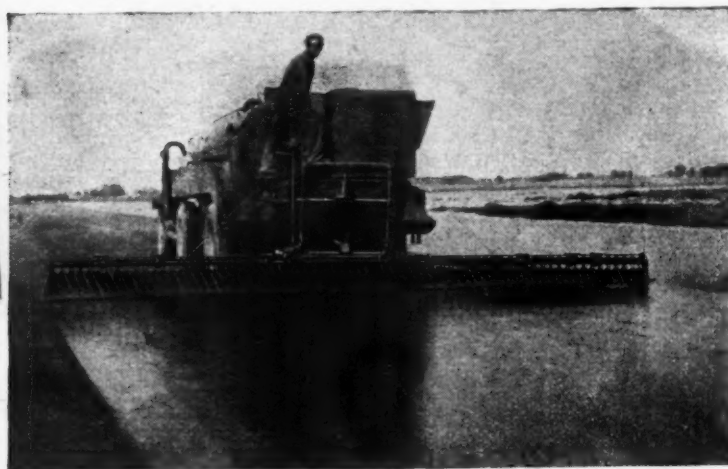
Have received many favorable comments from our customers as well as from the operators on the machine. Not once did your distributor hold up the men on the job.

Sincerely yours,

The Ferris Company

Ed Ferris

● APPLIES 600,000 GALLONS OF MATERIAL
WITH NO DELAYS OR TROUBLE WHATEVER



Working far ahead of the "gravel gang" there's never a loss of labor-time on men waiting for the distributor to catch up

NO TIME LOST IN LOADING—EASY TO CLEAN

The Model 424 can be loaded in half the time required by competitive makes.

The Two-Way Cleaning System guarantees a clean bar at the end of the day. First the material is sucked out of the bar and back to the tank. Then by turning one small valve, cleaning solvent can be released into the pump and spray bar (without contaminating the asphalt in tank). This solvent is then run into the pump and circulated through the piping and spray bar—flushed clean in a few minutes. No time lost in tinkering and removing parts to thaw or clean.

Write today for the name of your nearest dealer and complete information.

OTHER PRODUCTS
PRESSURE DISTRIBUTORS • STREET
FLUSHERS • MAINTENANCE DIS-
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Built to *The Highest*
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93



★ The most unusual rig in the outfit was the trailer-mounted diesel power plant. Note that the fuel tank is also carried on the trailer

Trailer-Mounted Power Plant



★ Portable field shop which along with a portable tool house are examples of ingenuity of Craig employees in their off time. The shop was designed to carry an electric light plant, portable welder, tools, bolt bins, oil drums, etc. These houses are plenty weather proof and can be locked securely

Part Of Minnesota Gravel Contractor's Portable Crusher Set-up

IN Minnesota and Iowa, gravel is found in a scattering of local pits. Many contractors specialize in producing pit-run stuff for general maintenance, and crushed and screened gravel for road-mixers or concrete, sometimes contracting for material in place and at other times acting as suppliers for other contractors.

Typical of the medium-capacity portable outfits seen by the R&S editor is that of S. W. Craig, Minneapolis material contractor, who was getting ready to supply gravel for A. Guthrie at the time these photos were taken.



★ Busy supplying 1200 c.y. per mile temporary pit-run gravel per mile for an adjoining road —this ¾-yd. shovel also was used later to feed the crusher



★ (Below): General view of crusher set-up, consisting of a dual-axle-supported crushing and screening plant, portable receiving hopper and conveyor, and trailer-mounted diesel power plant

★ An example of use of hardening rod to weld additional life into dipper teeth. Note beads extending across the cutting edges and part way along the corners



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Here's one that assures **BIG** Payloads and **BIG** Savings.

It's the Thornton 4-rear-wheel Drive. And it converts your medium-duty truck to a heavy-duty, six-wheel hauler—without the heavy-duty cost!

Trucks with a normal G.V.W. of 15,000 to 16,000 lbs. are boosted to a G.V.W. of 26,000 to 32,000 as a truck . . . 42,000 to 44,000 lbs. as a tractor. In addition, this conversion unit enables your trucks to haul heavier loads of road materials and equipment *right to the job!*



The Thornton 4-rear-wheel Drive includes a two-speed gear case assembly with a NoSPIN Differential. This famous automatic-locking differential assures

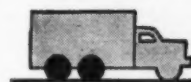
positive drive at all times. A NoSPIN Differential can also be installed in each driving axle to prevent wheel-spin.

You also get an extra driving axle to give you two instead of one—plus two extra wheels, four extra tires, heavy-duty "walking-beam" springs, necessary frame reinforcements and attaching parts. And because your load is spread over eight tires instead of four, you get far better flotation.

For full details call your truck dealer or local Truckstell distributor. Or send coupon below. The Truckstell Company, Union Commerce Bldg., Cleveland 14, Ohio.

THORNTON 4-REAR-WHEEL DRIVE

Converts a
Medium-duty Truck

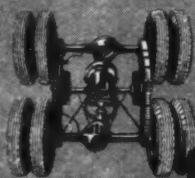


. . . into a Big, Powerful
Six-Wheeler

RESULT: 100% More Payload
100% More Tractive Effort

THE NoSPIN DIFFERENTIAL used in the Thornton 4-rear-wheel Drive will also increase the efficiency of 4-wheel trucks. Fits virtually any driving axle. Prevents wheel-spin . . . keeps trucks from stalling in mud, muck, sand, snow . . . on ice or slippery roads.

FREE! Send for your free copy of new illustrated folder. Tells how the Thornton 4-rear-wheel Drive will help you solve your problems.



**THORNTON
4-REAR-WHEEL
DRIVE**



TRUCKSTELL
SPECIALIZED EQUIPMENT FOR FLEET PERFORMANCE

Mfd. by **DETROIT AUTOMOTIVE PRODUCTS CORP.**
(Formerly Thornton Traction Company) DETROIT, MICH.

The Truckstell Company, Dept. RS-5
1274 Union Commerce Bldg., Cleveland 14, Ohio

Yes . . . I want to know *more* about the Thornton 4-rear-wheel Drive and how it will enable my _____ (make) trucks to earn more money. Please send free folder and name of nearest Truckstell distributor.

Name.....

Address.....

City.....Zone.....State.....

STANDARD ENGINEER'S REPORT



TEST DATA

UNIT

G.M.C. Diesel 6-71 ^{Bus engine} # 6711367

LUBRICANT

RPM Delo oil SAE 20 and

~~FUEL~~

(RPM Heavy Duty motor oil SAE 30)

MILES RUN

234,539

FIRM

L.A. Motor Coach Lines

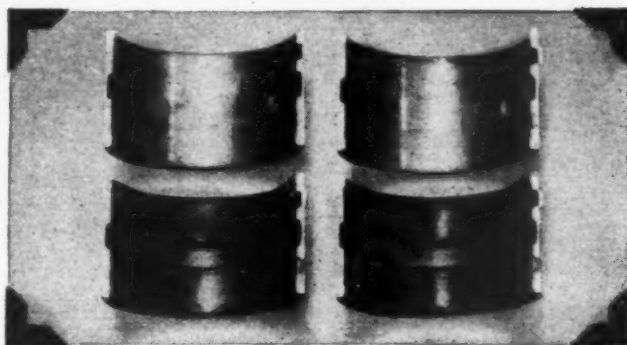
LOCATION

Los Angeles

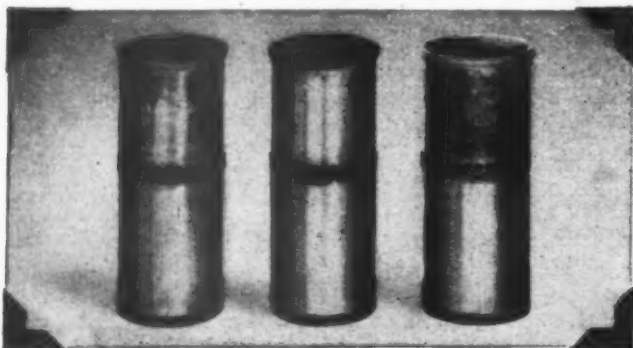
DIESEL BUS ENGINE RUNS 234,539 MILES ON RPM OILS
WITHOUT REPLACEMENT OF ANY PARTS



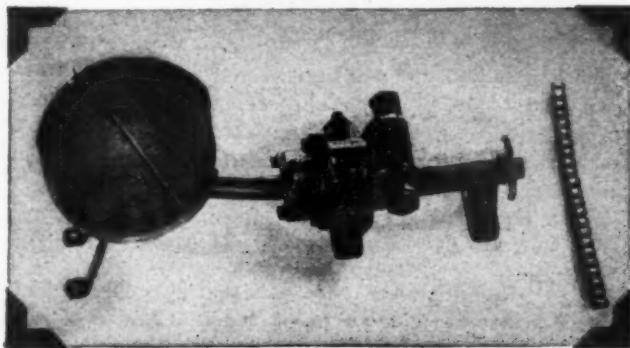
These pistons and pins came from a bus engine operated in city service for 234,539 miles on RPM Oils. As this photograph shows, they were unscratched and rings generally free. RPM Oils keep parts clean.



No cracks, pits or scoring appeared on main or connecting rod bearings. The highest wear measurement on any con rod journal was .0008"; on any main journal .0012". RPM Oils are non-corrosive.



All cylinders were smooth and varnish-free. Measurements on each showed wear from none to only .0035" near top of No. 4. No. 1 was .0013" out of round. RPM Oils stick on parts running or idle.



The oil-pump screen was clear of sludge and other foreign matter. RPM Oils are highly oxidation-resistant. Any sludge or loosened varnish and lacquer stay suspended and drain out with the oils.

REMARKS: The test on RPM Oils ended at 234,539 miles without bearing failure or piston seizure. (The longest run on any other oil before failure was 177,000 miles.)

RPM DELO Diesel Engine Lubricating Oil SAE 20 was used for the first 66,000 miles of the test, RPM Heavy Duty Motor Oil SAE 30 for the last 168,539 miles. Both of these oils contain special compounds which clean varnish, lacquer and sludge from engine parts, prevent corrosion, resist oxidation and keep lubricant on hot and cold spots alike.

Trademarks, "RPM," "RPM Delo," Reg. U. S. Pat. Off

STANDARD OF CALIFORNIA

REALIGNING A RAILROAD BED —Through TOUGH Glacial Deposits



FOLEY BROTHERS INC., ST. PAUL AND MARSCH-PETERSON CO., OMAHA; RR CONTRACT WESTERN NORTH DAKOTA.

—with a fleet of Wooldridge Terra-Cobras



WOOLDRIDGE TERRA-COBRAS employ the same Bowl features as Wooldridge "Terra-Clipper" tractor-drawn Scrapers

Across 16.6 miles of North Dakota's ruggedest terrain, a new roadbed for the Northern Pacific Railway has been carved through lignite and hard vitrified scoria. A sizable portion of the 3,750,000 cubic yards of glacial deposit was handled by a fleet of nine Wooldridge high-speed, heavy-duty Terra-Cobras. These units were frequently given the toughest assignments in the hardest cuts. Compaction was effected by routing the heavily loaded units over varied portions of the haul road and fill. To keep your earth costs down to rock bottom, investigate Wooldridge Terra-Cobras, today.

Measure Each Job in terms of WOOLDRIDGE EQUIPMENT:

- ★ High Speed EARTHMOVERS
- ★ Tractor-drawn SCRAPERS
- ★ BULLDOZERS
- ★ TRAILBUILDERS
- ★ RIPPERS
- ★ POWER CONTROLS

WOOLDRIDGE MANUFACTURING CO.
SUNNYVALE, CALIFORNIA
NATIONWIDE SERVICE

WOOLDRIDGE

TERRA COBRA

HIGH SPEED-SELF PROPELLED
EARTHMOVERS

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Your Best Bet

INTERNATIONAL



To clear land, cutting out trees at their roots . . . or to move hot slag from an open hearth furnace for a fill . . . these are run of the mill jobs for 'dozer-equipped International Diesel Crawlers.

Bulldogged power, dependability, serviceability and unbeatable operating economy make these tractors your best bet for every job, no matter how tough the going.

Excavate, remove overburden from ore deposits, cut through hills or ridges and build

highways, level land for airports or homesites or any other development. Yes, *move the earth* with International Diesel Crawlers . . . fast and economically.

Ask the nearest International Industrial Distributor for specifications or other information. Let him help select your power and equipment.

Industrial Power Division

INTERNATIONAL HARVESTER COMPANY

180 North Michigan Avenue

Chicago 1, Illinois

**CRAWLER TRACTORS
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS**

INTERNATIONAL



for Every Job

Diesel Crawlers

← Burnash Construction Company of Flint, Michigan, owns 10 International Diesel Crawlers and one gasoline wheel tractor. Freeman C. Burnash says: "The reasons I have only International equipment are: 1. The excellent service received from the distributor. 2. A lot faster machine. 3. Parts are more easily replaced as we don't have to take the whole machine apart to replace them. As long as this continues, our company will use only International equipment." The photograph on the opposite page shows one of the company's TD-14's working on a land clearing job for a housing project.

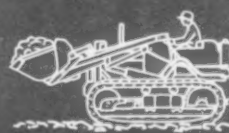
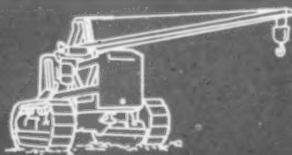


Tune in James Melton on "Harvest of Stars" every Sunday, NBC Network

↑ In Cleveland W. E. Plechaty's two International TD-14 Diesel Crawlers saved time and cut costs of moving hot open-hearth slag to fill a 5-acre hole for a building site. 18 carloads are handled each day.



Industrial Power

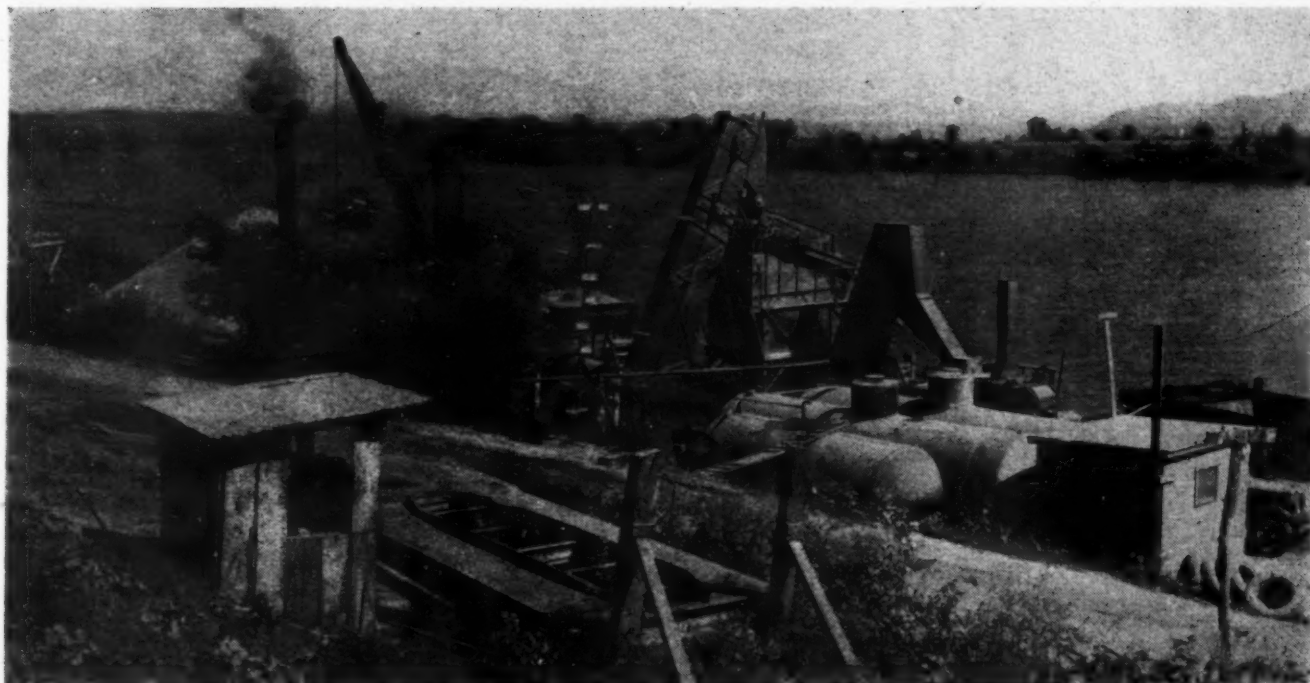


Barber-Greene presents . . .

the "545"—heavy duty pneumatic-tired Bucket Loader . . .

Here's a Bucket Loader that hits right at today's needs for mobility, high capacity and all-round usefulness. The 545 is B-G engineering at its finest and is way ahead with advanced performance features that include: two-wheel drive for fast maneuvering in cramped quarters and road speeds up to 5 m.p.h. It has the power and traction you want, too—three forward speeds and a fast reverse. Finally, it has the best of the B-G features proved on its companion crawler-mounted model such as: synchronized spiral feed that keeps the buckets full and the horizontal nesting boom for road travel or transport. And, of course, it has the B-G stamina that minimizes maintenance. See your Barber-Greene distributor or write Barber-Greene Company, Aurora, Illinois.





★ General view of plant in operation. Platform scales for weighing loaded and unloaded trucks. Individual weight tickets in triplicate are issued on a highway form for each load of mix

Volumetric Proportioning and Continuous Mixing Asphalt Plants in Ohio

By Fred W. Kimble

Engr., Bituminous Construction
Ohio Department of Highways, Columbus

IN ORDER to test volumetric proportioning and continuous mixing asphalt plants, Ohio sold a project late in 1945 on which this type of plant was permitted. Early in the spring of 1946 the plant was set up near the project. Two types of mixes were required on this project, one having a top size of $\frac{3}{4}$ inch and the other $\frac{3}{8}$ inch. Coarse and fine aggregate were from the Ohio River. The coarse aggregate had 40% of the material retained on the No. 4 screen crushed. The asphalt cement used was 85 to 100 penetration range.

The aggregate gradation control unit of the plant had four hot storage bins. On the coarse type of mix four-bin separation was used and on the finer mix three-bin separation was used. Proportioning of aggregates was controlled by their flow through calibrated gates on an endless feeder. About three hours were required to

calibrate the gates and set the mix. The asphalt cement was introduced into the mixer with the aggregate by a positive displacement pump. The drive of the pump was interlocked with the drive controlling the flow of aggregates.

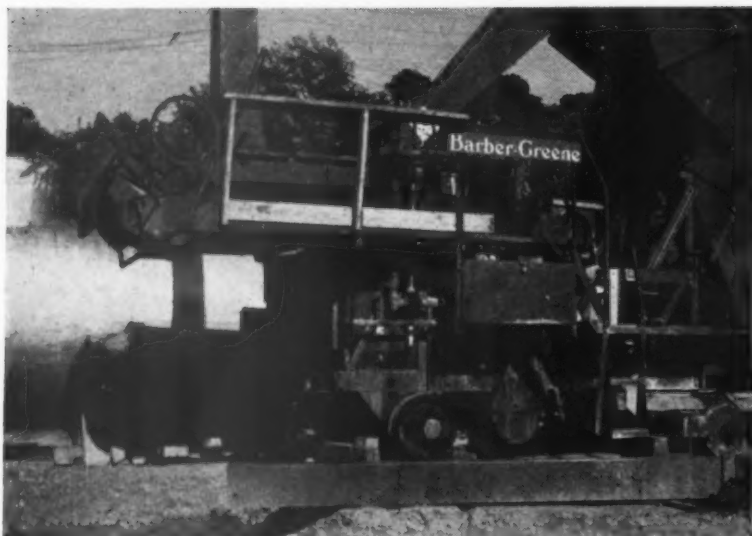
The mix fell from the mixer into

weighed trucks. Loaded trucks were weighed to determine the pay quantity. Trucks then carried the mix to the street and it was laid with a black top paver and finished with tandem rollers.

Satisfactory and uniform results were obtained with this type of mix-

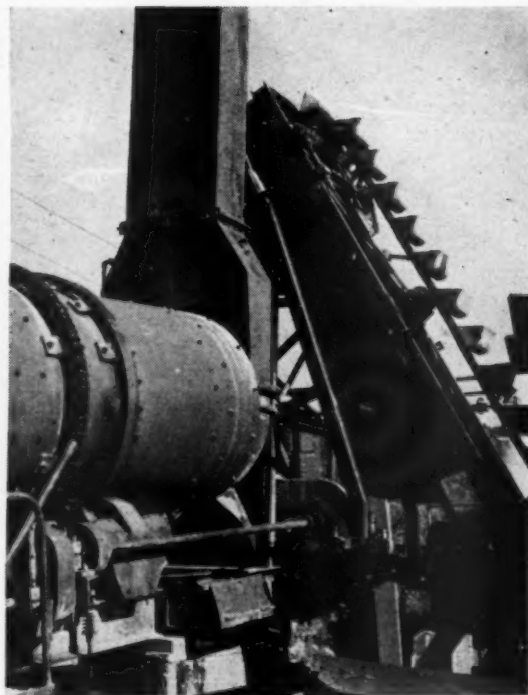


★ Highway Testing Laboratory Engineer in center checking plant for compliance with specifications. Men on either side represent the manufacturer



★ Mixing unit containing surge tank for bituminous material, positive displacement metering pump, and continuous mixing pugmill. Gate at end of mixer prevents spill of material while changing trucks. Graduation control unit with volumetric aggregate proportioning device. Proportioned aggregate falls into enclosed elevator discharging into continuous mixer

★ Cold elevator discharging into drier. Power for driving various units of the plant was from gasoline motors



ing. This trial furnished data and information necessary to write an operative specification for this type of plant. There are some required features in the new specification that this plant did not have, such as: a

revolution counter reading to 1/100 of a revolution on the aggregate proportioning unit, an automatic control to stop the aggregate proportioning and mixing operation when the level of material in any bin gets below the

top of the outlet gate, and a means of preventing segregation as the completed mix is discharged into trucks. Plants meeting this new specification will be permitted on bituminous concrete projects in Ohio in the future, when so provided in the proposals.

FOOTE
Kinetic
mixer

**FOR Profitable
WORK ON SMALL
ASPHALT JOBS**



Now it is possible to do all sorts of small asphalt jobs—at a profit—with the Foote Kinetic Mixer! You take the asphalt plant to the job... mix fast and thoroughly... get high asphalt output with a low equipment investment. For the first time, contractors with limited capital can share in the profitable jobs requiring quantities of asphalt that cannot be prepared economically in a regular plant. Write for details on the new Foote Kinetic Mixer—and the entirely new mixing principle that makes it possible.

See Page 19

THE FOOTE COMPANY, INC.
1936 State Street, Nunda, New York

- Handles any cold mix—fast!
- Capacity 3 cubic feet!
- An entirely new mixing principle!
- Thoroughly coats every particle of aggregate in seconds!
- Fully portable—easy to handle!
- High output with low equipment investment!

Builders of...

Adnan Black Top Pavers,
MultiFoote Concrete Pavers,
and Foote Kinetic Mixers.

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WEST VIRGINIA: Construction Equipment & Supply Co.,
Wheeling.

MISSOURI: Cooke Tractor Co., St. Louis.
Funkhouser Machinery Co., Kansas City.

UTAH: Cate Equipment Co., Salt Lake City.

IDAHO: Southern Idaho Equipment Co., Idaho Falls.

MONTANA: Caird Engineering Works, Helena.

NEW MEXICO: Bud Fisher Co., Albuquerque.

ARIZONA: W. P. Powell Machinery Co., Phoenix.

CALIFORNIA: Buran Equipment Co., Oakland.
Moore Equipment Co., Stockton.

OREGON: Clyde Equipment Co., Portland.

WASHINGTON: A. H. Cox Company, Seattle.

SHAW WHEELER ROLLER DEALERS IN CANADA:

QUEBEC: Rene Talbot, Ltd., Quebec.

Mussens Canada Limited, Montreal.

ONTARIO: Truck & Tractor Equipment Co., Toronto.

MANITOBA: Mumford Medland, Ltd., Winnipeg.

SASKATCHEWAN: Western Tractor & Equipment Co., Regina.

ALBERTA: Costello Equipment Company, Ltd., Calgary.

WHEELER ROLLER DIVISION

SHAW SALES & SERVICE CO.

5100 Anaheim Telegraph Road — Phone AN 1-7141
Los Angeles 22, California



AT LEFT: A WHEELER TANDEM ROLLER doing an excellent compacting job near Warner Bros. First National Pictures, Burbank, California.

BELOW: This illustrates the same job and shows how the WHEELER TANDEM ROLLER works in close.



FOR CLOSE WORK AND ALL ROLLER WORK USE THE New WHEELER TANDEM Roller

It finishes right to the curb or building line—or any place where you have to "roll close"—that's one big reason why construction men all around the country are developing a strong preference for the NEW WHEELER TANDEM ROLLER. . . . It's a money saver—a money maker—because IT ELIMINATES THE EXPENSIVE HAND LABOR required with rollers that can't get in close and finish the job.

It's an "easy shift" handler, too, with its mechanical clutch—linked to a single lever. A gear shift movement of only a few inches, forward and backward, moves the roller SMOOTHLY on Timken Roller Bearings without shock or chatter.

The NEW WHEELER TANDEM ROLLER is built for its job. . . . It's rugged—with sturdy steel frames and heavy precision-cut gear drive. The compaction and steering rollers have extra thick machine-finished steel surfacing plates.

OTHER WHEELER ROLLER FEATURES INCLUDE: 3 to 4 ton weight. 4 cylinder, 1400 R.P.M. industrial gas engine—your preference of Allis-Chalmers or Hercules. Combination foot pedal and service brake. Low center of gravity. High ground and curb clearance.

Specifications

DIMENSIONS: Length, 10-ft. 7-in. Width, 3-ft. 6-in. Height, 3-ft. 11-in.

COMPACTION ROLLER: Width, 36-in. Diameter, 37-in.

STEERING ROLLER: Width, 34-in. Diameter, 27-in.

POWER: 4 cylinder, 19.2 Brake H.P. at 1400 R.P.M., industrial gasoline engine, with 2 forward and 2 reverse speeds. Transmission: First, 1.5 to 2.5 M.P.H. (forward and reverse). Second, 2.5 to 4 M.P.H. (forward and reverse).

SPRINKLER SYSTEM: Gravity type. Tank Capacity, 45 gallons.

COMPRESSION PER LINEAL INCH: Compaction roller, 150 lbs. with ballast. Steering roller, 70 lbs. with ballast.

WHEELER ROLLER DIVISION SHAW SALES & SERVICE CO.

5100 Anaheim-Telegraph Road, Los Angeles 22, California

Immediate Delivery—See Your Dealer or Write for Folder Giving Complete Information

BELOW: Two flat cars of WHEELER TANDEM ROLLERS roll east for delivery in New York City and Pittsburgh, Pa.



This is a box-girder cross-member.



It is a Mack box-girder. Mack engineers designed it; you find it only on Mack trucks. It has proved the best all-around cross-member ever designed.

It has tremendous beam strength in both vertical and horizontal planes. It possesses extremely high torsional rigidity. Its specially designed jaw ends assure greatest possible stiffness at every junction.

Consequently, it ties side-members together positively; always keeps them uniformly spaced. It imparts exceptional torsional stiffness to a frame. It won't spraddle. It produces a frame that won't weave, a frame that stays true, a Mack frame!

This cross-member is an example of what we mean when we say a Mack is a precision-built truck and not a mass-production truck. Every part of a Mack is specifically designed and engineered to do its job.

We put this extra work into Macks—so you can get extra work out of them.



Mack

since 1900, America's hardest-working truck

Mack Trucks, Inc., Empire State Building, New York 1, New York. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts. In Canada, Mack Trucks of Canada Ltd.

Trucks for every purpose



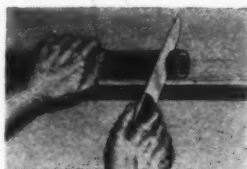
WIDENING THE WORLD'S BUSIEST HIGHWAY was a job that called for Macks. New Jersey's Route 25 out of New York often averages 100,000 cars a day. When four new lanes were added, husky, dependable Macks like this hauled in the materials.

HOSE COUPLING

How to attach it correctly and add to service life

From "Hose Coupling Handbook"
published by Hose Accessories Co.

BE sure to cut ends of hose squarely before attaching couplings. Lubricating knife with water will facilitate cutting.



RIGHT

Never cut hose at an angle, or without proper support.



WRONG

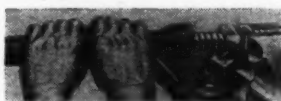
Avoid the dangerous practice of cutting or attempting to burn out any portion of the tube to permit the entry of too large a shank. Never try to force a pipe nipple into straight end of hose—it cannot be done. Use the right hose coupling with rounded stem, permitting easy insertion and protection to hose tube.



WRONG

The danger points of any hose are at the ends. Correct size coupling shank must be selected to avoid dam-

aging hose tube. The inside diameter of hose will determine the size of coupling to use. Don't try to force hose on a coupling shank that is too big!



WRONG

Never hold hose at an angle to force it over coupling stem or shank. This causes tube damage or possible rupture.



WRONG

Place the coupling in a vise. Hold the hose horizontal and apply pressure. If necessary, lubricate with rubber cement or soft soapy solution. Don't use oil or grease!



RIGHT

Tight fit between hose tube and coupling shank of stem is essential for proper seal.

Special couplings for wire braided hose used in hydraulic or steam service can be supplied with special turned shanks for these applications when so specified. This permits easier insertion and avoids possibility of

rupture, since such types of hose have no "give" in the tube.

Preliminary tightening is done by taking up bolts while clamp is held in vise.



Final tightening to proper sealing point is accomplished by holding spud end of coupling in vise. Be sure to tighten all bolts equally to avoid distortion.

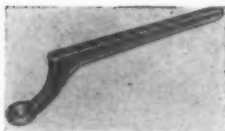


Avoid the expensive practice of removing or cutting back any portion of the hose cover to apply a clamp. This will cause premature failure.



WRONG

Always use a spanner wrench for gripping the pin lugs securely. This relieves strain and permits easy tightening.



Never attempt to connect "shank type" hose couplings with a hammer. Fracture or breakage of the pin lugs may result.



WRONG

In those numerous instances where couplings are desired with their quick detachable feature, the most practical method is through use of "leader hose." Usually this hose is from six to twelve feet long, depending upon requirements. One end is attached directly to pneumatic tools through use of air hammer hose couplings; female and male high pressure hose couplings; or steel air hose nipples with hose clamps depending on the service requirement. Other end of hose is connected with long lengths of hose through the use of universal type quick detachable hose couplings with hose clamps. This permits pneumatic tools to be easily moved about from operation to operation with complete safety to operators.



RIGHT

Never attach universal type quick acting hose couplings directly to pneumatic tools because of the danger of constant vibration.

Avoid Hose Abuse

A little care in the handling, use and storage of hose will result in appreciably longer life and material savings in operating costs.

Steam Hose Failure

One of the commonest causes of steam hose failure is the collapse of the inner hose tube, resulting in partial blocking of the hose and reduced volume of flow. Breaks or leaks in the hose tube permit steam to enter the cotton fabric of the hose with eventual "burning out" of the carcass and complete failure of the hose.

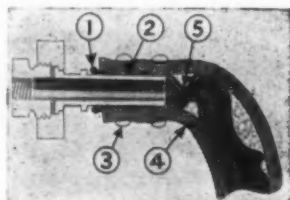
Such collapse of the inner tube is frequently caused by improper selection of hose couplings, using inferior couplings, or by carelessness in attaching them to the hose. Just how this occurs is clearly shown in the one illustration below.

The other illustration shows a high pressure hose coupling properly attached to steam hose with four-bolt high pressure hose clamp.

WRONG

Improperly Attached Coupling Causes Steam Hose Failure

1. Hose only partly on hose coupling stem or "shank." Gives inadequate support to hose, resulting in hose tube "flowing" from under clamp.



WRONG

2. Cotton duck or fabric exposed. Careless insertion of hose coupling stem causes exposure of fabric and eventual breakdown of hose. (See previous instructions for correct procedure for inserting coupling in hose.)

3. Wrong location of hose clamp. Clamp placed too near end of hose coupling stem causes "crowding" of hose tube and direct exposure of fabric to steam.

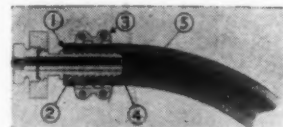
4. Kinking and bending of hose. Improperly supported hose can kink or bend, forcing sharp end of poorly designed coupling stem against hose tube, cutting and weakening it and admitting steam into cotton fabric.

5. Ruptured or separated hose tube. When inner hose tube is damaged or separated, steam escapes into fabric of hose, causing cotton fabric to char. Collapse of hose and clogging of steam passage will result, with premature hose failure and possible danger to the operator.

RIGHT

Well Designed Hose Coupling, Properly Attached, Helps Prevent Hose Failure

1. Hose "all the way on" hose coupling stem or "shank." Coupling stem gives full support to hose. No distortion of hose tube.



RIGHT

2. No exposed fabric. Careful insertion of stem into hose prevents damage of hose tube and exposure of cotton fabric. (See previous instructions for correct method of inserting hose coupling stem.)

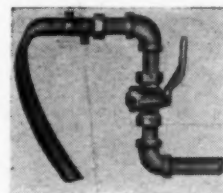
3. Correct hose clamp location. Clamp is located at midpoint of coupling stem. Especially designed for steam or any high pressure service, have stems slightly longer than hose clamp, preventing hose tube from being forced over end of stem.

4. Good hose stem design. This coupling stem has properly rounded ends with correct radius to prevent cutting or snagging of hose tube. Stems are designed to give full support to hose, preventing sharp bends or kinks.

5. Undamaged hose tubes. Protects cotton fabric of hose from injury by steam. Provides full flow passage and maximum hose life.

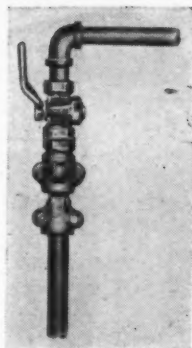
Never attempt to connect steam hose directly to a pipe line by forcing it over an iron pipe nipple and securing it with a hose clamp. Since the I. D. of a hose is smaller than the O. D. of pipe of comparable size, the tube of the hose will be seriously cut and damaged by the larger diameter and rough edges of the pipe.

Prevent reduction of flow, inefficiency and excessive strain caused by hose pulling downward from upright or horizontal fixed outlets. This will result in breakdown in hose wall where all internal pressure is directed against point "A."



WRONG

Use a pipe fitting elbow to relieve breaking strain and stress. Many lengths of serviceable hose which might otherwise be ruined can be saved with this practice.



RIGHT

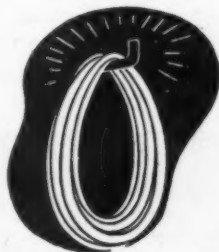
Never use grab hooks in handling hose in transit, or knives and other sharp instruments in unpacking it.



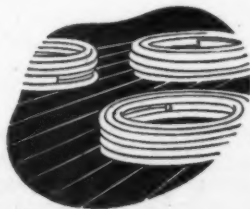
Don't expose hose to direct rays of sun. Keep away from steam pipes or other heat sources. Store in cool, dry place.



Never hang hose on nails, hooks, or other objects causing sharp bends. Strains may result with permanent deformation, weakening hose and thus increasing danger of leaks and "blow-outs."



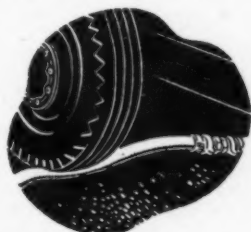
Always keep hose carefully coiled and resting on a flat, horizontal surface.



Never substitute one type of hose for another. Use of hose not specifically designed for the service intended invariably shortens its life and can result in costly and even dangerous failures.



Guard against hose damage by trucks or heavy falling objects. Air, oxygen and acetylene hose are particularly dangerous when damaged because of the high pressures and explosive gases involved.



Prevent kinking, either accidental or deliberately (to stop the flow). It breaks the wall and results in premature failure of the hose.



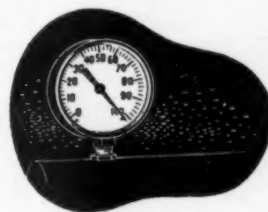
Always reel up hose before moving it about and when it is not in use.



Be sure to flush out and drain after use. Your hose will last longer.



Guard against excessive pressures in steam hose. They are very dangerous to life and property.



When hose becomes worn at coupling ends, worn portion should be removed and re-coupled. Clamp tightness should be checked periodically and bolts tightened if necessary. It's good safety! It's good economy!

Care of Hydraulic Hose

(These tips offered by Eastman Mfg. Co.)

More hose is destroyed by improper handling than by use. Heavy objects should not be dropped on the hose, nor should it be subjected to sharp blows, pinching, twisting, or chafing. A sharp impact may cause a permanent kink in the wire strands on which the strength of the hose is dependent. When this happens, recurring applications of hydraulic pressure subject the kinked wires to a bending and unbending action which eventually causes them to break. Once the wires are broken, the hose lacks sufficient strength to withstand the hydraulic pressure, and leakage occurs.

Installing Hose

Most hydraulic hose has a synthetic lining impervious to oil, and breaking of this lining destroys the usefulness of the hose. When installing the hose lengths, care should be taken that the hose is not twisted. They should be mounted in a way that will subject them to as little twisting action as possible. Elimination of torsional (twisting) strain adds to the working life of the hose.

Hose Couplings

Two wrenches should always be used on hose couplings. Couplings are made with a hexagonal section to allow for a wrench grip that will hold the hose stationary in the correct position while drawing up the union con-



nection. Always use this extra wrench grip to prevent twisting.

Storage

Spare hose should be stored in straight lengths and, when possible, kept in dark cool locations.

Layered Construction of Hydraulic Hose

1. Inside tube which resists action of oil and heat.
- 2 & 4. Layers of steel wire braided to give flexibility at high pressures.
- 3 & 5. Layers of rubber to prevent

friction between wire layers—also to add flexibility of the hose.

6. Cotton duck to which the cover is attached.

7. Outside cover which resists the deteriorating action of oil and heat, abrasion and sunlight.

These various layers are all firmly united into a strong, yet flexible hose for conducting fluid under extremely high pressures.

Road Show Set for Summer 1948

The most spectacular Road Show in the history of the American Road Builders' Assn. is scheduled for Soldier Field, Chicago, July 16-24, 1948.

In announcing the first outdoor summer show, J. T. Callaway, A.R.B.A. president, states that for the first time in the long series of Road shows the construction equipment manufacturers will have unlimited outside space for proper display of their machines, while exhibits requiring cover will be amply taken care of in expansive enclosed exhibition halls.

"Because of the lapse of eight years since the last Road Show," Callaway says, "we have decided to extend the show to nine full days to give the entire construction and roadbuilding people a chance to see the new development in the machines and materials of construction and maintenance."

Tentative plans for holding the show in February, 1948, at the Chicago Dodge plant were abandoned when investigation revealed adequate inside space would not be available there or in any other site considered. Soldier Field offers an exhibition hall of over 100,000 sq. ft. of space and a million sq. ft. of paved open area adjacent to the east and south sides of the stadium exhibition hall. Ample hotel space has been arranged for the duration of the show.



OTC

MAINTENANCE TOOLS

CUT DOWN LAY-UP TIME

Repair jobs on road machinery are speeded up SAFELY—on the job or in the shop—with the portable OTC PULLING SYSTEM. It removes and replaces gears, bearings, sleeves, wheels, shafts and other close-fitting parts—easily, quickly and without damage. A set of OTC PULLERS will pay for itself on one job, in time saved alone. Approved by Hyatt, M-R-C, New Departure, SKF and Timken for use in pulling and installing their bearings.

OTC GRIPOMATIC PULLERS, PUSH-PULLERS, Pulling Attachments and Adaptors, BOX WRENCHES and other tools are made in sizes to handle practically every maintenance job.

Write for OTC Maintenance Bulletin showing some of many time-saving uses of OTC TOOLS.

OWATONNA TOOL CO.
319 CEDAR ST., OWATONNA, MINN.





PM-15 Maintenance Set includes necessary OTC TOOLS for repair work on track-type tractors, Diesel motors and all types of road maintenance machinery.

TRANSITS and LEVELS

HEADQUARTERS for REPAIRS—any make

We will buy or trade in old Transits Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalogue RS-105 of Engineering Instruments, Engineering Field Equipment and Drafting Room Supplies.

WARREN-KNIGHT CO.

Mfgs. of Sterling Transits & Levels
136 N. 12th St. • Philadelphia, Pa.

Toll Proposals Called "Threat to U. S. Highway System"

Calling attention to proposals for "super" toll roads now being considered by legislatures of 13 states or already acted on, Arthur C. Butler, Director of the National Highway Users Conference, urges the nation's taxpayers and motorists to examine with "utmost caution" all such projects.

The Conference encompasses 1,000 affiliated national, state and local groups of highway users, including those of private car operators.

Mr. Butler's statement asked, "Who is 'selling' these roads? In many cases they are supported by earnest, conscientious citizens who sincerely believe in their worth." but he cites a New Hampshire newspaper's claim that a \$6,500,000 toll highway proposed in its area is backed by out-of-state underwriting firms admittedly hopeful of capturing the lucrative commissions on the bonds.

Mr. Butler's statement continued: "Regardless of how pressure for such roads originates, there is no discounting the threat they pose to the free highway system that has helped make America mighty in war and peace, or their peril to construction of great new free roads on which nobody has to pay a toll to ride. The public must understand that threat and that peril.

"The issue is toll roads or free roads. Free roads mean free movement of goods and people. Anything that interferes with that free movement must be examined with utmost caution.

"Many factors are involved in the current promotion of toll road plans. Public understanding of these factors is required.

Private Funds Only?

"Proponents of toll roads say that only by that kind of financing can modern, up-to-date roads be built. That is not so. Our great highway system was built up without tolls and largely on a pay-as-you-go basis. It was built on the sound and reasonable basis that the gasoline taxes of the states would be used for better highways and not for other purposes.

"Right now road building costs are high. If great toll highway projects are started, their competition with free roads for manpower and materials will inflate costs still more. If that happens, the free roads will cost the taxpayer more and so will the toll roads—should the taxpayer want to use them.

"Many toll roads must be extravagantly designed in order to attract

traffic away from other good free roads. Yet is this attraction enough? The Pennsylvania Turnpike was designed to be used by 12,000 vehicles a day. Yet it is carrying only one-fourth of that total, and it will probably never reach capacity use because of the competition of free roads.

"There are other financial factors involved. Because some toll roads are financed by bonds which the states refuse to treat as their own obligations, interest rates probably are higher than on the money the state might borrow for free roads. This forces higher tolls if the roads are to be self-supporting—which is at best just a hope in many cases.

Maintenance Problem

"The existing roads which toll highways would bypass still have to be maintained and improved by the states for local traffic. The states just can't close roads on which thousands of small communities and farmers and short-trip travelers depend. And if a toll road should fail to be a financial success, its state would have to take it over, too, and pay the enormous costs of double maintenance.

"There is still another direct cost for the toll-road traveler besides his contributions to the original and maintenance cost of the toll road. Such roads require numerous collectors as well as a duplicating police force and salaried executive personnel. The toll-road traveler has to foot the bill.

"In one current toll road proposal cost estimates vary more than 100 per cent. Thus the toll can't be realistically fixed in advance. In that state the toll-road advocate is being sold a pig in the poke."

Bills providing toll roads have been enacted into law in Arkansas and West Virginia, Mr. Butler reported. Others are pending in California, Connecticut, Georgia, Maine, Maryland, Massachusetts, New Hampshire, New York, Oklahoma and Washington State.

Traffic Death Toll Picture Encouraging

The National Council announces that 4,510 persons were killed in traffic accidents during the first two months of this year.

The council said the total was encouraging, despite its size, for three reasons:

1. The two-month toll is 17% below the figure for the first two months of 1946, and 19% under the same period

in 1941, when traffic deaths hit an all-time high.

2. The decrease was accomplished despite greater mileage.

3. The mileage death rate (deaths per 100,000,000 vehicle miles) in January was the lowest for any January since such records have been kept.

Perfect records were reported by 257 cities for February, of which the largest was Kansas City, Mo., with a population of 399,200. The second largest was Richmond, Va. (240,000), and third was Omaha, Neb. (223,800).

During both January and February, 190 cities reported no traffic deaths, the largest being Norfolk, Va. (231,000). Salt Lake City (165,000) was second and Wichita, Kan. (154,000) was third.

The three leading cities in each of several population groups for the two months, ranked on the number of traffic deaths per 10,000 registered vehicles included:

From 200,000 to 500,000 population—Norfolk, Va., 0.0; Kansas City, Mo., 0.6; Oklahoma City, 1.8.

From 100,000 to 200,000—Wichita, Kan., 0.0; Salt Lake City, 0.0; Berkeley, Calif., 0.0.

A.E.D. Executive Committee Meets

Officers of the Associated Equipment Distributors attended the spring meeting of the AED Executive Committee at Niagara Falls, Ontario, May 10 and 11.

Those attending included Pres., William A. Danner, Parker-Danner Company, Boston; Exec. V. Pres., A. F. Garlinghouse, Garlinghouse Brothers, Los Angeles; V. Pres., C. F. Halladay, Halladay-Dettman Co., Sioux Falls, S. D.; V. Pres., H. L. Burleson, Browning-Ferris Machy. Co., Dallas; V. Pres., V. J. Sheridan, Sheridan Equipment Co., Ltd., Leaside, Canada; Treasurer, Eldon M. Farnum, Allied Construction Equip. Co., St. Louis; Executive Secretary, C. F. Winchester, Washington, D. C.; Chairman, National Affairs Committee, Henry M. Hale; Chairman, Advisory Board, Frank B. McBath, Portland, Ore.; Chairman Finance Committee, W. W. Bucher; Editor, Construction Equipment News, Morton R. Hunter.

Following this meeting, the AED officers attended the Annual Convention of the Canadian Association of Equipment Distributors at Niagara Falls, Canada. Exec. V. Pres. Garlinghouse and other AED officers attended regional conferences of the association prior and subsequent to these meetings.



Heavy-Duty Goose Neck

★ What ho? It's the kind of a picker-upper every contractor wishes he had now and then—good for snaking an engine out of a tractor, moving the finishing machine to a new lane, etc. A cable control unit operated from the transmission serves a 5-part line for lifting or lowering the hinged boom, and separately operates the hoist hook. Seen on N. M. Ball's US 101 paving job south of L. A.



A Good Yard Crane

★ Wm. Ziegler & Co., Minneapolis equipment distributors, once fixed up this stocky crane job for their yard. Compact. Lots of hoisting capacity

Contractors' Service and Utility Trucks Seen in the Editor's Rambles

More varied in style than women's Easter bennets, but all for the same purpose—to speed the job and save money—these outfits are mostly shop-assembled by

contractors and their men. Note: more and more contractors are fitting their trucks with commercially made hoists and other service equipment.



Traveling Work Bench

★ Here they're acetylene cutting a piece of strap iron. This field repair outfit of Brown Bros. (Denver and Albuquerque) also has two enclosed tool and parts bins neatly built underneath, leaving the bed clear for use as bench space



Welding Outfit on Trailer

★ Why tie up a perfectly good truck just to move a welding outfit around? That was the reasoning of Dominick Cinci, of Nick Cinci & Sons, contractors on a road project near Lancaster, Ohio. A set of old Ford car wheels and some tinkering in the shop, resulted in the handy trailer shown. Also, why use a truck when you can use a jeep, is another question suggested here



Folding Boom on Many-Purpose Truck

★ Utah Construction Co. men built this service car; 1-ton truck chassis, shortened and given dual rear tires. Rear boom operates from a winch, folds as shown when not in use. Truck also has a generator, tools, work bench space. Airfield in southern Utah



Everything But the Kitchen Sink

★ (Upper left): What have we here, complete with milk cans and desert bag? It's a "fix-all" outfit owned and operated by contractor Dominick Leone, of Trinidad, Colo. Leone's wagon includes a compressor, generator unit for light plant and welder, tool box, work-bench space at rear. US 40 W. of Denver

Balloon-Tired Oxy Cart

★ You can push it like a wheelbarrow, or tow it over the highway—this acetylene outfit, mounted on a pair of old auto wheels. Being used by Louis Garavaglia, Detroit excavating contractor, to torch-heat the bottom pan of a drag bucket in an effort to straighten it with a hydraulic jack

Shovel-Crane Nursemaid

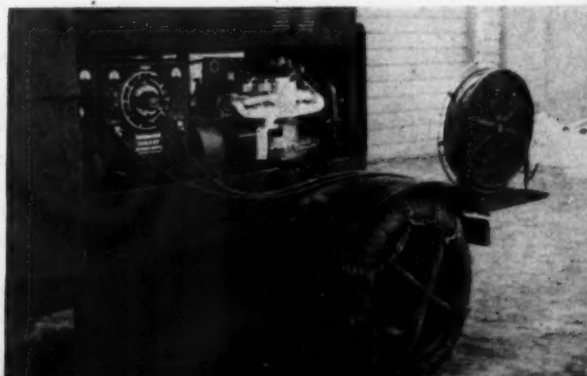
★ Rebuilt to carry several drums of wire rope, welder and tool chest—owner: Louis Garavaglia, of Detroit. Also has a light folding boom



Winkelman's Shopmen Built This One

★ Just off the "assembly line" and posed in the doorway of D. W. Winkelman's big garage at Syracuse, is this welding and general-service truck. Designed and assembled by shop supt. Archie La Pointe and master mechanic Bob Bird to embody ideas gained in

moving millions of yards of dirt and rock. Includes a 300-amp. 3-KW. generator, 6-cyl. gasoline industrial engine; hook-up for lighting equipment, drills and grinders; acetylene equipment; and (back of cab) compact tool box. Extra-long 187-in. wheelbase



New Construction Equipment and Materials

1

New Portable Asphalt Plant

A new portable asphalt plant, embodying the twin pug mill mixing method and a heating and drying unit for aggregate, has been announced by Ford Industries, Inc., Columbus, O. of which Perry T. Ford, former Ohio director of highways, is head. The plant, which is slated to have a capacity of 40 to 50 tons per hour, can be operated by one man. Its design provides for controlling the mixing process, at every stage, with absolute certainty. It has a circulating asphalt feed accurately gauged to the required quantity. The proportioning of aggregates is accomplished prior to entering the drum-heated rectifier. The plant can be set up ready for produc-

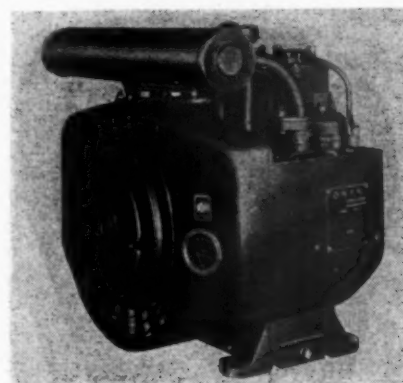
tion. The drum (rectifier) prepares the aggregate for the mixing process by raising the temperature to a desired constant to assure uniformity at all times, regardless of air temperature. Production is maintained by the use of an auxiliary drier as weather conditions may demand. A "skip" feeder and "belt" conveyor are optional to accommodate owners who have other means of batching and loading in truck.

2

New Gasoline Engine

A new 10 HP., 4-cycle, air-cooled prime mover, weighing only 97 lb. has been added to the line of D. W. Onan & Sons, Inc., Minneapolis, Minn. The engine has a 3 in. bore, 2 3/4 in. stroke and 38.8 cu. in. piston displace-

ment. Among the important engineering improvements incorporated in the engine, aside from the factors which make it cool running, are the opposed cylinder construction results in smoother running balance and



CK Engine

freedom from vibration. An improved ignition system has been developed for this engine which consists of a low voltage pulse-generator which supplies current to a hermetically sealed, high voltage ignition coil mounted on top of the engine for easy servicing. The ignition breaker points and condenser are also mounted on top of the engine and are readily accessible. A gear type oil pump provides positive pressure lubrication. A concentric float type carburetor and specially designed crank case permit mounting and operation of the engine at wide angles from the vertical.

3

New Material Spreader

A new, all welded spreader box that can be bolted on the dump truck body, replacing the tail gate, has been placed on the market by Yuan Dragline Buckets, Baton Rouge, La. A box that fits a 6 ft. wide dump body weighs only about 105 lb. The operation is very simple: The half



Showing Power Unit, Heated Asphalt Pump and Controls

tion in from three to five hours and it can be transported on a trailer or pulled by a truck or tractor without the need of a special permit. The pug mill gate is air-controlled for instantaneous discharge. The heating

Mail Inserted Card

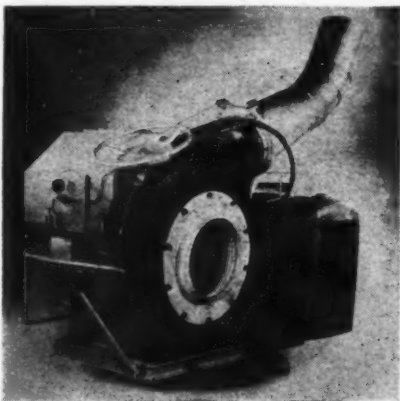
For data on equipment described on these pages. See also inquiry blank on page 132.

circle opening can be regulated to any desired aperture up to 6 in. The material, sand, gravel, shell, loose dirt, crushed stone and the like, then pours through this opening evenly aided by the force of gravity. It can be operated either of two ways: (1) A driver plus a helper—the helper walking alongside the truck, or riding on the body, keeping the flow even by regulating the opening; (2) The driver sets the opening, and keeps the flow regular by proper elevation of the truck body.

4

New Sprayer for Insect Control

A new sprayer for the application of insecticides has been announced by the Lawrence Aero-Mist Sprayer Co., Greenfield, Mass. It is claimed that through the use of the specially designed Aero-Mist Fan operating at 3600 revolutions per minute the Lawrence Aero-Mist Sprayer shoots a practically invisible mist of concentrate to affected areas at a speed of 150 m.p.h. Highest trees as well as field crops are easily and thoroughly sprayed. The sprayer is light and compact and is so designed as to be mounted on a ¾-ton platform truck. One man can easily operate the sprayer as all controls are under finger tip control within easy range



Lawrence Aero-Mist Sprayer

of the operator's seat. At slight pressure of the operator's foot the sprayer can complete a 360° circle thus assuring complete coverage in every direction without troublesome backing and turning about of the truck. Other unique features are an aerodynamically designed, directional air nozzle, Benway spray jets that inject insecticide concentrates into high speed air currents, Novo water cooled engine, 47 gal. concentrate tank sufficient for 3 to 4 hours of spraying and air-flo baffle plates to secure directional and controlled application of air borne spray particles. Of spe-



New Osgood Type 71 1/4 Cu. Yd. Excavator

cial interest to those concerned in the care and protection of trees and shrubs is the claim that "mist spraying" with DDT at the correct time of the year will kill the elm bark beetle—a carrier of the Dutch Elm Disease. Gypsy moths, Japanese beetles, canker worms, plus practically all other defoliators are effectively and economically controlled.

5

New Motor Oil

A new extra-duty motor oil designed for gasoline operated equipment has been announced by the Amalie Division of L. Sonneborn Sons, Inc., New York, N. Y. The new product, Amalie E-D motor oil, is designed to protect against carbon and varnish formation, sludge deposits, bearing corrosion, and breakdown or deterioration of the oil itself. It contains new ingredients formulated to keep engines cleaner, assure quick, easy starting, aid in prolonging engine life, reduce ring sticking, and keep oil and gas consumption to a minimum. Other properties claimed for Amalie E-D include its ability to prolong oil filter life, end dry starting, overcome foaming troubles, and purge and wash away harmful products of combustion.

6

New 1 1/4 Cu. Yd. Shovel

A new 1 1/4 cu. yd. machine, the Type 71, has been announced by The Osgood Co., Marion, O. Along with Osgood air control and air-cushion clutches, the Type 71 incorporates other Osgood features which are the result of 75 years of experience in the manufacturing of excavating machinery. Features of the machine include the following: Extra wide boom foot is pin connected to the one-piece cast steel main deck. Crowd chain is self-adjusting to any boom

angle. Crowd chain tension easily adjusted. Dipper trip is air controlled. Boom is of Man-ten steel, all welded. Shipper shaft pinions of manganese steel with splined section on shaft — no pins or keys used. Double outside dipper sticks are of Man-ten steel, with deep shrouded manganese racking, all welded. Adjustable hook rollers relieve the centering gudgeon and vertical travel shaft of strain. Conical rollers are adjustable in and out on the extra large diameter rotating path gear. Hook rollers are mounted on anti-friction bearings. The Type 71 is available as both crawler and wheel mounted machine. The Model 710, mounted on crawlers, is available as shovel, dragline, clamshell, crane, backhoe, and other combinations, and is readily interchangeable from one class of service to another in the field. The Model 715 mobilcrane is a pneumatic tired, one engine, one-man-operated material handler.

7

New Septic Tank Cleaning Unit

A new unit engineered primarily for the sanitary service field but which also has uses in the street and



Septic tank cleaning unit

highway fields has been announced by the Gorman-Rupp Co., Mansfield, O. The unit consists of an 1100 gal. steel tank served by a new Gorman-

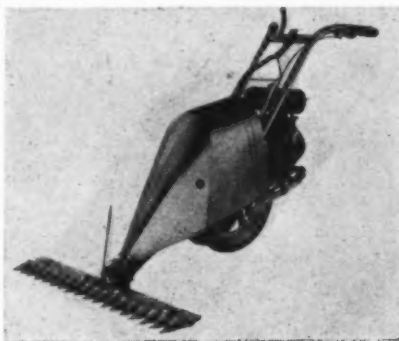
Rupp self-priming, centrifugal sewage pump and driven by a 20 hp., 4-cylinder, Wisconsin air-cooled gasoline engine. The entire unit mounts on any standard truck chassis of 158 to 161 in. in length. The O.S.C. operator simply backs his truck near the open septic tank. The fluid in the septic tank is drawn into the pump and jetted back into the septic tank until all solids are held in suspension. Then by simply turning a valve the contents of the septic tank are quickly pumped into the truck tank. Operators using test models in the field report 500 gal. septic tanks cleaned regularly in 15 minutes and 1000 gal. tanks in 20 minutes. The O.S.C. unit has many other uses. It can be used for street flushing, race track sprinkling, emergency fire fighting, dewatering flooded basements or hauling water for concrete construction work.

8

New Power Scythe

A new power scythe having many applications in the highway field such as mowing along roadsides, around historic markers, under guard rails and around culverts has been placed on the market by Jari Products, Inc., Minneapolis, Minn. Designed to cut weeds, brush and tall grass, the Jari scythe mows right up to trees, posts

and buildings, as well as under fences and shrubs. It follows the ground contour closely, and is easy to operate, even on slopes and in rough places. It is stated that with the Jari scythe one man can cut four to six acres in an eight-hour day. The



Jari Power Scythe

scythe is equipped with an extra-heavy 36-in. sickle bar and is powered by a 4-cycle, air-cooled gasoline engine rated at 1½ H.P. The new twin ballbearing driveshaft, a feature of the 1947 model, insures smooth, quiet operation and cuts fuel consumption. The engine will run a full 8-hour day on five quarts of gas. Power transmission to the sickle bar is by means of a V-belt from the drive shaft

pulley. The ground wheels are independent of the sickle drive. A convenient lever on the handle bar engages the ground wheels to make the scythe self-propelling. Ground wheels on the 1947 model are newly designed for better balance and easier turning. Puncture-proof tires of semi-pneumatic construction are 20 in. in diameter with wide faces for better traction. Weight of the Jari power scythe is 145 lb. uncrated.

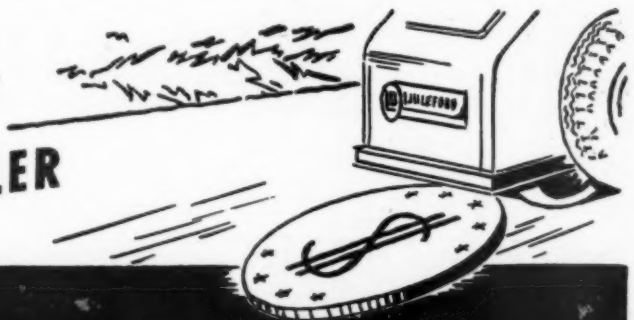
9

New Paving Breaker

A new paving breaker, the PB-8, has been announced by Ingersoll-Rand Co., New York, N. Y.

This new 82 lb. machine is suitable for heavy-duty demolition work and general paving breaking jobs. The new kicker-port valve used in the PB-8 greatly increases the efficiency and striking power of the machine. Oil economy is assured by a metering device that furnishes proper lubrication for all working parts. An adequate oil reserve is provided by a generous size oil reservoir in the handle. A rigid joint between the handle and cylinder is the result of four bolt construction. Reverse buttress threads on the fronthead bolts provide sufficient tightness without over-stressing the bolts. An improved

Make Your Repair Dollar Cover More Roadway with LITTLEFORD TRAIL-O-ROLLER



This Littleford No. 155 Trail-O-Roller covers ground like a kid in a baby walker! It makes your dollar do a bigger job because whatever it rolls is there to stay. Gets to more jobs because it trails safely at any speed. Patented Hydraulic lift converts it easily from rolling to trailing position. Powered by air-cooled engine; has automotive type steering control, heavy duty transmission, machine finished cast main roller. Use Trail-O-Roller for all patch work, shoulder widening, alley paving, airport runways, driveways, parking areas, school yards...everything! Write for Bulletin No. 3 today.



LITTLEFORD

LITTLEFORD BROS., Inc.

454 E. PEARL ST.,

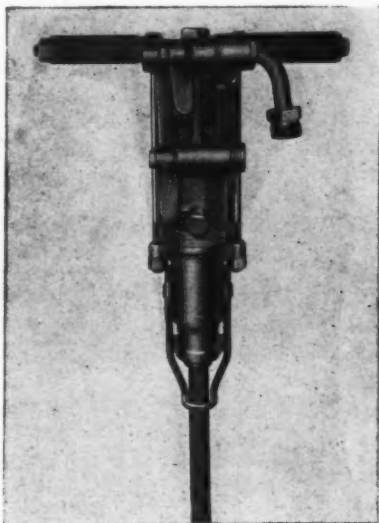
CINCINNATI 2, OHIO

throttle valve allows the gradual entrance of air and permits easier and smoother starting. Other features found in this new paving breaker are a sturdy block-type piston, long anvil-block bearing and a longer handle. The long anvil-block bearing assures correct alignment between the cylinder and fronthead. The longer handle provides a larger gripper surface to reduce operator fatigue. In addition, the PB-8 paving breaker may very easily be converted into a pile driver or spike driver by simply changing frontheads.

10

New Light Weight Drill

A new light-weight rock drill in the 30 lb. class, the J-30 Jackhammer, has been announced by Ingersoll-Rand Co., New York, N. Y. This new drill was designed for drilling medium to hard rock. An outstanding feature of this Jackhammer is a new three in one backhead which allows the machines



The J-30 Jackhammer

to be easily converted to any one of three types of machines, wet, dry, or blower type. In addition the J-30 has a new sealed throttle valve, a stronger rifle bar, a two-piece chuck and a long wearing piston. Generous bearing faces have been provided on the cylinder, piston stem bearing and fronthead. Fronthead alignment is maintained and an extra-rigid joint results.

11

New Tractor Loader

The Loadtrac, a new attachment for the Ford tractor, designed for digging, loading and lifting, has been placed on the market by Loadtrac Co., Chicago, Ill. It is stated that



FINEST DEVELOPMENT In Municipal Paving Units **JACKSON** ELECTRIC HAND SCREED

with PORTABLE POWER PLANT

FOR MUNICIPAL PAVING OPERATIONS WHERE WIDTH OF SLAB VARIES, STREET AND ALLEY INTERSECTIONS ARE NUMEROUS AND OBSTRUCTIONS SUCH AS MANHOLES, SEWER OPENINGS, ETC., ARE ENCOUNTERED, THIS COMBINATION OF JACKSON EQUIPMENT TOPS ANYTHING PREVIOUSLY USED. And it likewise is ideal for paving HIGHWAY BRIDGE DECKS, HIGHWAY PATCHING and INDUSTRIAL FLOORS. Light weight, easily transported — easily operated by two men.

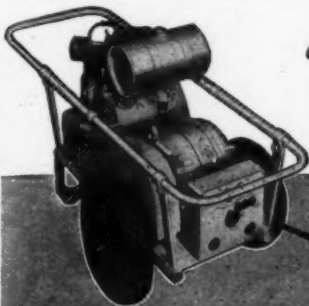
The screed, which tends to propel itself forward, strikes off and places any mix varying from 4" to 1/2" slump concrete and leaves the slab surface in ideal condition for finishing with minimum labor. Second pass if required is quickly made. Operators stand on hard ground — not in soft concrete.

THE COMPLETE UNIT CONSISTS OF:

- 1 The Model SC-200A Screed for any width slab as specified from 8 to 20 ft. — activated by the famous Jackson Vibratory motor.
- 2 Jackson Type M-1 Portable Power Plant which provides a wide range of vibratory frequencies thus assuring perfect placement of any concrete mix usually specified. Also ideal for operating flood lights, internal concrete vibrators, drills and any other portable power tools within its capacity.

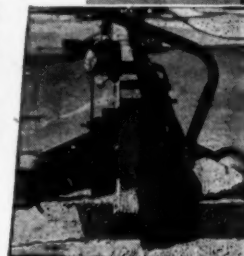
The JACKSON M-1 Power Plant

Capacity: 1.25 K.V. Generates both single phase and 3 phase 110 Volt 60 Cycle AC power. Husky Wisconsin engine. Permanent magnet generator which has no brushes, rings or other small parts requiring adjustment or maintenance. Trouble-free.



By all means

get the complete facts on this time and money-saving paving unit. Write, TODAY!



Operating Position Model SC-200A Screed



For Second Pass or Transportation Along Forms. The Screed Is Elevated Clear of Slab.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

the design of the Loadtrac enables the greatest hydraulic force to be exerted at the "breaking-out" position at which point it will lift 2000 lb. and sustain, at a height of 8½ ft., 1000 lb. It raises to this height in 5 seconds and lowers to the ground



The Loadtrac

in 4 seconds. The loading thrust is transferred to the rear wheels through horizontally mounted cylinders removing any strain from the tractor itself. A built-in, self-contained, hydraulic system provides finger-touch control with its power derived from a heavy-duty, low pressure, 7½ gpm pump driven continuously by a heat-treated spline drive from the front of the crank shaft. The frame of the Loadtrac serves as a reservoir for 5 gal. of hydraulic fluid. The tractor's own hydraulic system remains free for other uses. The Loadtrac is mounted to the tractor in front by the installation of a

special axle hinge pin to which the front of the loader is attached.

12

New Electrodes

A complete line of stainless steel electrodes in a full range of grades and diameters has been announced by Wilson Welders & Metals Company, Inc., New York, N. Y. All Wilson stainless steel electrodes are furnished with a heavy extruded lime type coating for D.C. application. In addition all but the straight chrome analyses are obtainable with a lime-titanium type coating which is usable on A.C. or D.C. The slag produced by either of these coatings is easily removed.

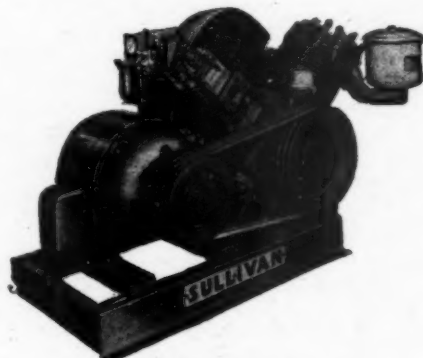
13

New Compressors

A complete new line of two-stage, air-cooled stationary air compressors has been announced by the Sullivan Division, Joy Manufacturing Co., Pittsburgh, Pa. "Unitair" compressors are available in nine sizes with power requirements ranging from 15 to 100 hp. and piston displacement from 81 to 590 cu. ft. per minute at 100 lb. discharge pressure per square

inch, based on 60 cycle motor speeds. The three standard electric drives include built-in motor, direct-connected motor and V-belt drive. "Unitairs" may also be equipped for use with gasoline or diesel engines.

Some of the outstanding features



"Unitair" Compressor

of these compressors include: force-feed lubrication through rifle-drilled oil passages by means of a positive, gear-driven pump. . . "Cascade" oil cooling to reduce oil consumption and oil sludging . . . low-lift, large port-area, direct concentric valves for high efficiency . . . low piston speeds for long life . . . oversize ball-type main bearings for low maintenance . . . four piston rings per piston mounted

Clean Cool

DRINKING WATER

Stop GERM SPREADING PRACTICES

PORTABLE SANITARY

MEETS REQUIREMENTS OF PUBLIC HEALTH AUTHORITIES

FOR CONSTRUCTION AND MAINTENANCE CREWS

The Dobbins PORTABLE SANITARY DRINKING FOUNTAIN protects the health and strength of workmen on any job... anywhere... with cool, clean drinking water—at the press of a button! Aids railroad, highway and building construction, repair and maintenance crews... miners, and all other workmen on jobs where a permanent, sanitary drinking water supply is *not* available. Banishes germ-spreading practices such as use of "common" drinking cups, open pails, dippers, etc. Four gallon capacity tank is fully insulated. Air pressure for instant flow of water is supplied with a few strokes of the pump.

DOBBINS MANUFACTURING COMPANY
DEPT. 522, ELKHART, INDIANA

DISTRIBUTORS: Some territories are open for this fast-selling item. Write for complete details.

FOUNTAIN AND ACCESSORIES • AVAILABLE FOR IMMEDIATE DELIVERY

<p>No. 18 — Dobbins Superbilt Portable Drinking Fountain less all accessories. Only \$16.00</p> <p>Salt Tablet Dispenser, 500 tablet capacity, extra \$2.75</p> <p>Adjustable, Waterproof Carrying Strap, extra \$1.15</p> <p>Spill Cup, to catch overflow when used indoors \$3.50</p>	<p>Mounting Bracket, holds fountain to wall or floor of buildings, trucks, tractors, locomotives, etc. . \$4.50</p>
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All prices F. O. B. Elkhart, Indiana, Circular on request.

Dobbins

Superbilt

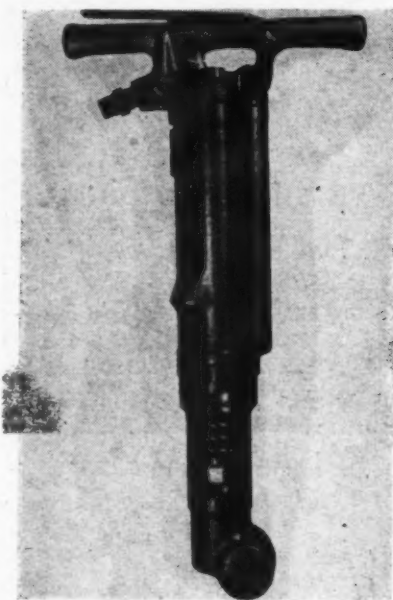
PORTABLE DRINKING FOUNTAIN

above the pin for oil economy and for long-lasting, air compression efficiency.

14

New Paving Breaker

A new paving breaker, Model B-80, has been added to the line of Schramm Inc., West Chester, Pa. The model has a length of 27 in., a weight of 80 lb., a cylinder bore of 2 13/16 in., and a stroke of 4 in. The B-80 is fully air cushioned and improved in materials and details of design to make it a stronger and more durable



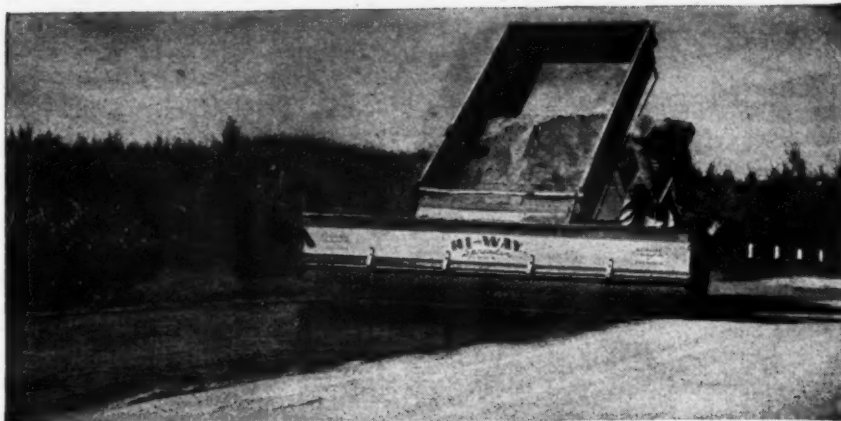
Model B-80 Paving Breaker

breaker. It is provided with an ample oil chamber to aid in the proper lubrication of parts. High grade special analysis drop forgings, carefully machined, heat treated and accurately ground are used. Unless otherwise specified the breaker is fitted for the use of 1 1/4 in. x 6 in. shanks. 1 1/4 x 6 in. shanks provided when specified.

15

New Portable Welder

A new self-powered arc welder is now offered by Harnischfeger Corp., Milwaukee, Wis. This P&H Model WN-200 Welder, available as a stationary or trailer unit, is an N.E.M.A. rated machine of 200 amperes, but has a welding service range of from 30 to 260 amperes. Both types have engine and welder securely mounted on an all-welded frame of sturdy steel tubing and heavy angle iron. The skid model is ideal for carrying on trucks. A large lifting eye for crane lifting is provided. The trailer model has been engineered especially for use in the field. Car-



**EASIER OPERATION . . .
FASTER,
MORE PROFITABLE
SPREADING WITH HIGHWAY SPREADERS**

The Hi-Way Model R Material Spreader with REVERSIBLE Transmission

Put more profits into your pockets by saving time and material. Shift one lever and you can operate the Model R Spreader forward or backwards to suit the job. Spiral feed roller and agitator-conveyor have reversible transmissions assuring positive action and steady flow of material regardless of direction. Feed gate adjustment controls thickness of spread. Width can be adjusted from one foot to full width of spreader. Entire unit is balanced for easy hook-up to truck. Swivel type self-coupling hitch allows traction wheels to remain in constant contact with ground... assures even distribution on any job. Hi-Way Model R Material Spreaders are available in 8, 9, 10, 11, 12, and 13 foot widths. Write for complete details.

Spreading is a ONE MAN job with the HIGHWAY MODEL DD



This remarkable spreader clamps onto tailgate of any dump truck. Permits one man to cast a uniform spread 8 to 60 feet wide at truck speeds up to 35 miles per hour. The DD casts material close to ground under and ahead of rear wheels of truck. It is equipped with adjustable feed gates controlling thickness and direction of spread, and throttle on 1 1/2 H.P. Briggs & Stratton gasoline engine to control width. Material feeds into hopper by gravity—no shoveling required. The Model DD is widely used for low cost seal coat work, for spreading

calcium chloride on gravel and dirt roads for dust control in summer, and for spreading sand and cinders on highways, streets, and airports for ice control in winter. Write for specifications.

HIGHWAY EQUIPMENT COMPANY, INC.

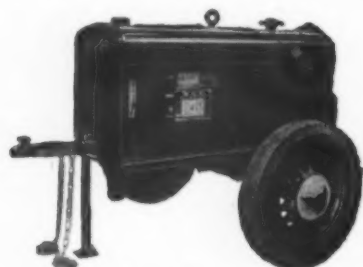
605 D Avenue N. W.

Cedar Rapids, Iowa

Sold and Distributed by Leading Construction Machinery Dealers Throughout the United States and Foreign Countries

MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS

ried on a running gear of standard track width, the trailer welder has standard size pneumatic tires as regular equipment. There is an adjustable front end supporting stand for use when the welder is standing



P&H Model WN-200 Trailer Welder

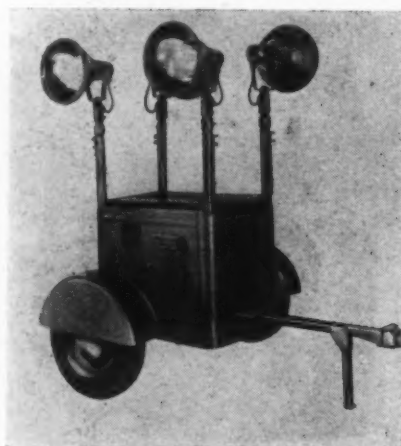
alone. A ball and socket hitch and safety chains are provided. Both models are equipped with P&H's well-known square frame arc welding generators. There is just one control for any desired welding heat from minimum to maximum capacity.

16

New Mobile Floodlighter

The new floodlighting unit placed on the market by D. W. Onan & Sons, Inc., Minneapolis, Minn., is completely self-contained and is easily operated by one man. It can be hitched to

any vehicle and towed safely at high speed. The floodlighter assembly consists of an Onan-3000 watt AC electric plant, plus four powerful floodlights. The 750-watt floodlights are mounted on steel standards that may be raised to a height of 7 ft. and



New Mobile Floodlighter

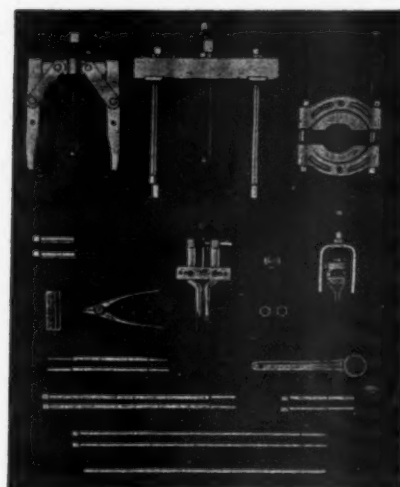
which swing a full 360 degrees horizontally, with a wide vertical arc. Each floodlight is operated by a separate toggle switch. A wide selection of floodlight combinations are available. The Onan 4-cycle gasoline engine, prime mover for the electric

generator, is air-cooled. The floodlighter has electric push-button starting, and the generating unit provides a DC output for re-charging the two heavy-duty starting batteries. Four convenient receptacles are available for operating auxiliary lights or electric tools.

17

New Tractor Service Set

A complete set of tractor service tools for the Avery line of tractors



Tractor Service Set

You get a real lift with a HANSON Crane

Low center of gravity; full revolving; air controlled steering; extra long crawlers; all clutches easily adjusted and relined without dismantling shaft assemblies; heavy duty industrial type gasoline or diesel motor; and other outstanding features!

Write for Catalog RS-547.



Rated at $4\frac{1}{2}$ ton lift (the larger size is rated at $6\frac{1}{2}$ ton) this rugged smaller brother in the Hanson family can juggle its rated tonnage with effortless ease and have hoisting power to spare!

It is quickly convertible to Shovel ($\frac{3}{8}$ yd. and $\frac{1}{2}$ yd.) Dragline, Clam-shell or Trench-hoe. Above the illustration are listed a few of the features which, built into this smooth-working trouble-free, profit-making unit, have helped make it popular around the world:

Other HANSON products: Yard & Dock Cranes -- Truck Shovels -- Heavy Duty Machinery Trailers.

HANSON

CLUTCH AND MACHINERY
COMPANY - TIFFIN, OHIO

has been announced by the Owatonna Tool Co., 319 Cedar St., Owatonna, Minn. This puller set will handle 95% of the service jobs involving the removal and installation of bearings, gears, shafts, pulleys, couplings, pinions, outer bearing races and other close-fitting parts.

MANUFACTURERS' LITERATURE

18

Steel for Highways

The various products manufactured by Bethlehem used in the construction of highways are described in a booklet issued by Bethlehem Steel Co., Bethlehem, Pa. They are listed under the following headings: Right of Way; Highway Bridges; Bridge Foundations; Paving; Highway Guards and Posts. Products illustrated and described include reinforcing bars, structural steel, pipe, bar mats, mesh, road joints, wire rope, highway guards and posts and steel piling. Tables of dimensions, weights, properties, etc., are included.

19

Light Weight Tire Pump

A new light weight pump for liquid-filling tractor, implement and construction equipment tires is fully described in illustrated bulletins released by the Gorman-Rupp Co., Mansfield, O. These pumps will evacuate tires of liquid or air and then fill with water or calcium chloride solution as recommended by tire manufacturers. Full instructions on its use and operation as well as tire liquid capacity charts and calcium chloride solution charts are given.

20

Pneumatic Construction Tools

A complete line of Schramm construction tools is illustrated and described in a bulletin issued by Schramm, Inc., West Chester, Pa. Specifications are given for rock drills, paving breakers, clay diggers, trench diggers, backfill tampers, tie tampers, line oilers, pneumatic chain and circular saws, concrete vibrators, chain saw sharpener and pneumatic air gun.

Special W-W low-bed built for the Public Service Co. of Colorado



save time & manpower on HEAVY hauling

Here are the features of the W-W low-bed that save time, money and manpower for you—features proven in use by contractors, State, County, and municipal highway departments, heavy hauling contractors, industrial concerns and others the nation over.

Exclusive loading ramps are in place in less than three minutes for loading or unloading of self propelled equipment. Lower ramp section may be used as equipment (or road) chock when needed . . . the top section returned to transport position and your equipment is on its way to the next job.

Tandem Bogie axles (oscillating type) means less operational upkeep, longer tire wear because these axles conform to road contours, keep the load evenly distributed over all tires.

Heavy duty frame is engineered to distribute the load over all cross members, eliminates strains at central point . . . assures you a bed that will take any load within the rated capacity.

These are just three of the many features that make this W-W low-bed the trailer that does all heavy hauling easily and more economically.

IMMEDIATE DELIVERY available on standard 10 to 60 ton low-beds on both semi or full trailer types. For illustrated catalog, clip coupon to letterhead and mail today.

Mail today



The WINTER-WEISS Co.

2201 Blake Street

Denver 2, Colorado

Gentlemen: Please send illustrated catalog on W-W Low-beds. We are particularly interested in a _____ ton capacity trailer with loading deck length of _____ ft. behind gooseneck to front of rear tires.

Firm Name _____

Address _____

City _____ Zone _____ State _____

By _____ Title _____

21

Diesel Engines and Power Units

Two new 8-page Diesel engine pamphlets now being distributed by the Industrial Power Division of the International Harvester Co., Chicago, Ill., give complete specifications for the UD-14A and UD-18A Diesel engines and power units recently placed in production by International. Bearing areas, moments of inertia, material specifications, and dimensions

are but a few of the facts listed. The UD-14A is the new $4\frac{1}{4} \times 6\frac{1}{2}$ 4-cylinder Diesel rated at 76 hp. as a power unit when operating at 1400 r.p.m. The UD-18A is the new $4\frac{1}{4} \times 6\frac{1}{2}$ 6-cylinder Diesel rated at 125 hp. as a power unit when operating at 1600 r.p.m. The performance charts included contain power curves for peak horsepower, intermittent horsepower, and continuous horsepower. Corresponding torque curves demonstrate the lugging ability of the engines. Fuel consumption at wide-open throttle at intermittent load ratings

is represented for engine speeds of 1600 to 600 r.p.m. The variety of ways a basic engine can be equipped to best satisfy a user's needs is graphically illustrated in each of the pamphlets.

22

Hauling Air-Entrained Concrete

Dumperete, a special utility body for handling air-entrained concrete, is illustrated and described in a bulletin issued by Dumperete Division, Maxon Construction Co., Inc., Dayton, O. This body has a 90-degree dump angle, a folding adjustable chute that swings a full 180 degrees from one side to the other and a positive cutoff gate. The Model C body discharges at a point 6 ft. from the ground and the Model 2 C 5 ft. from the ground.

23

Patrol Grader

The new improved Model Trojan utility speed patrol is illustrated and described in a bulletin issued by Contractors Machinery Co., Inc., Batavia, N. Y. Among the outstanding features claimed for this patrol is the rugged, nonchattering blade circle and a superior hydraulic system equipped with flow regulating valves to each ram. Specifications are included.

24

Control Methods for Termites

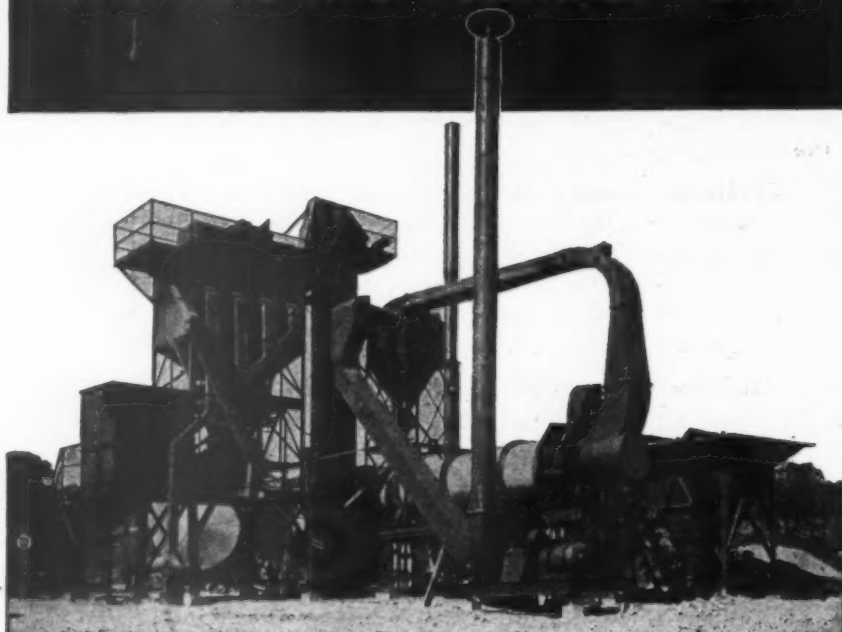
Timely information on the habits and elimination of wood-destroying insects is contained in a folder on "Penta" Preservative. The title is, "Chemical Control Methods for Termites and Lyctus Beetles." The folder tells how these pests operate and presents evidence to show the effectiveness of "Penta" Preservative, (5% pentachlorophenol in petroleum solvent).

25

Portable Power Saw

The new Nordberg-Buday portable power saw is described in a bulletin published by Nordberg Manufacturing Co., Milwaukee, Wis. The 4-page bulletin is illustrated with pictures showing capacity and various cuts that can be made without rehandling the lumber. Operating features, specifications and weights also are given.

**74 TONS OF HOT MIX PER HOUR
WITH THIS H&B PORTABLE PLANT**



THE MOTO-PAVER

This new H & B traveling plant does the complete mixing and paving job. Write for Bulletin MP-47.

● This Hetherington & Berner portable asphalt plant, recently installed for the West Virginia Black Rock Co., of Charleston, W. Va., has averaged better than 74 tons per hour. This is a PA-20 plant, with all-electric drive wired complete at the H & B factory.

These PA plants are easily portable by truck and are designed especially for the contractor who moves frequently, and who must be able to get efficient production on small as well as large jobs.

A new bulletin, P-46, describing our PA and PE type plants, will be sent on request.

HETHERINGTON & BERNER INC.
721 Kentucky Avenue, Indianapolis 7, Indiana
Builders of Portable and Stationary Asphalt Plants of All Types and Capacities

Hetherington & Berner



26

Purchasing Constructing Equipment

"Financing Purchases of Construction Equipment" is the title of a new booklet issued by C.I.T. Corporation, New York, N. Y. It points out the advantages of C.I.T. financing of equipment purchases and explains how the necessary arrangements can be made.

27

Earth Boring Machine

The Hydrauger, a machine that bores holes 2 in. to 14 in. in diameter for installing pipe underground, is illustrated and described in a catalog issued by Hydrauger Corporation, Ltd., San Francisco, Calif. Diagrams showing cost, speed and accuracy of operation, are given. Included also are general operating instructions and specifications.

28

Clay Products

Dimensions and specifications of sizes and fittings of various clay products are given in a bulletin issued recently by The Robinson Clay Products Co., Akron, O.

Compaction of Soils

(Continued from page 86)

specific method. Kneading is that result from wobble-wheel pneumatic-tired rollers, rubber-tired earth moving equipment, and traffic. In a theoretical sense, it is a combination of weight and vibration. Some qualifications of weight must be made at this point, since known instances of light-traffic rolling have produced some of the highest known densities. This may tend to prove that fast-moving light loads are producing a vibratory type of compaction beyond the reach of weight.

In general, however, certain accepted methods follow for the types of soils compacted. Granular soils, such as sands and gravel, are most affected by weight and vibration. Flat-drum type rollers augmented with wobble wheel pneumatic tired rollers would perhaps prove the most economical, as well as the best type of compaction for these soils. But as the clay and silt content of granular soils increase, surface rolling tends to merely produce a thin hard layer with

Talk about Performance!
CARVER PUMPS
really deliver when jobs are tough



CARVER
certified
centrifugal
pumps

If you want a pump that primes lightning fast, that handles oceans of water at exceptionally high efficiency, and stands up easily under toughest operating conditions... the pump you want is a CARVER Certified Centrifugal Pump.

In every way they'll give you better pumping performance on the tough jobs—and the easy ones—because their modern streamlined design and construction gives you all these outstanding advantages:

- ★ High Capacity at high suction lift.
- ★ High Efficiency at high pressures and at slow speeds.
- ★ Non-Recirculating—no priming gadgets.
- ★ Life-Time Seal—wearing surfaces are almost diamond-hard.
- ★ Fewer Working Parts because of simple design.
- ★ Non-Clogging—streamlined design.
- ★ Performance of each pump is *certified*.

Capacities from
3000 to 200,000
G.P.H. Sizes
1½" to 10". Ask
for Bulletin 100.
Carver Pump
Co., Muscatine,
Iowa.

CARVER
PUMPS *Muscatine*
Iowa

only slight penetration. Here the sheepsfoot or tamping type roller has its place. This type of roller, when used properly, compacts from the bottom up.

In the use of rubber-tired hauling equipment as rolling units, care must be used to not route heavier wheel loads over the area being compacted than what the maximum supporting capacity of the soil will carry. If such equipment moves over the area, previous compaction may be destroyed and lateral displacement of the material takes place. It is always best to roll with lighter loads than the maximum permissible and to roll faster. The wobble-wheel pneumatic-tired rollers developed especially to produce traffic compaction results, are ideal for the heavier clay and silt soils when such materials are laid in relatively thin layers. The rubber tire of the wobble-wheel roller can best be described as "flowing" over the soil particles, moving and kneading them into the best available relationship with one another. This means removal of voids, and perfect compaction is the removal of all voids.

Interest in Vibration

Mechanical vibration as a compaction means has been recognized

and is creating a good deal of interest. As yet, no commercial means are available which would pay out on any sizable construction job.

As we look towards the future in airport and highway construction and visualize heavier and heavier loads that will be imposed on pavement surfaces, proper soil compaction becomes a major issue. Larger and larger rollers will be devised to produce greater depths of higher density sub-grades. This ultimate super-compaction will prove a boon to surface pavement construction in cost, design, and long life, and give the general public more safety in transportation.

WITH THE MANUFACTURERS & DISTRIBUTORS

Appointed Sales Representative

David R. Moser has been appointed Minneapolis sales representative for Columbia Chemical Division of Pitts-

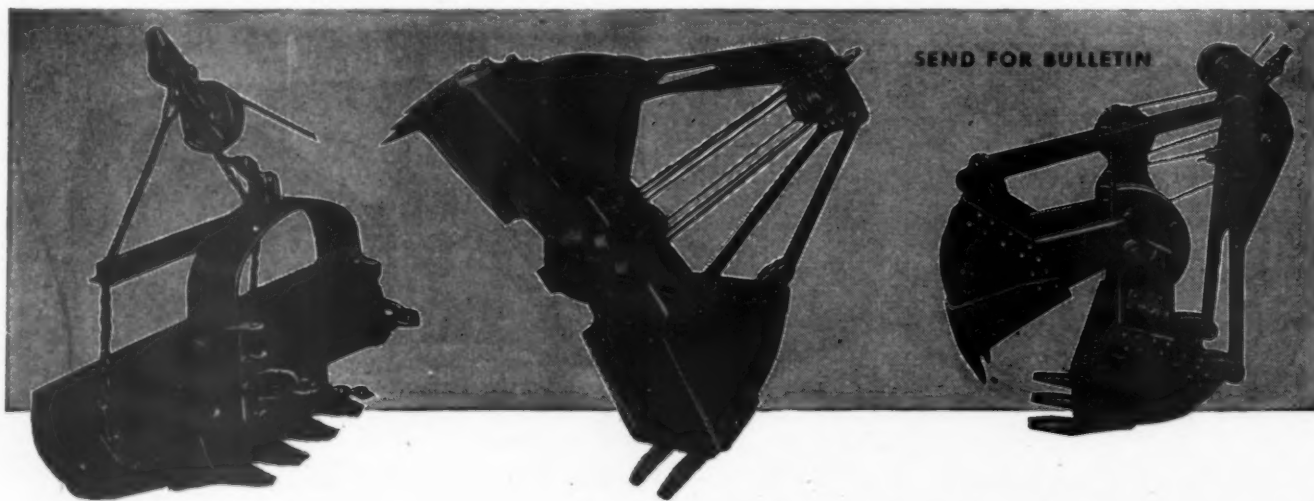
burgh Plate Glass Co. He joined the Columbia Chemical research department at the Barberton, Ohio, plant in 1938. Commissioned in the U. S. Army shortly after Pearl Harbor, he served in the European, African and middle eastern theatres. Upon his separation from the service early last year with the rank of captain, he returned to the technical and sales departments of the Columbia Chemical Division.

W. C. Champion Dies

William C. Champion, Seattle, Wash., veteran employee of the Shovel and Crane Division, Lima Locomotive Works, Inc., Lima, O., died April 4, 1947, at the age of 65. "Champ," as he was known to his many friends, joined the Lima firm June 27, 1930, as district manager of the Pacific Northwest Territory, the position he held until the time of his death.

New B-G Distributor

Townscro Equip. Co., Oklahoma City, Okla., has been appointed by Barber-Greene Co., Aurora, Ill., as exclusive distributor in the State of Oklahoma, representing the Barber-Greene Construction and Industrial Divisions.



For Longer Life! **WELLMAN** *Williams Type* **BUCKETS**

● Count on longer life and more efficient service ... due to Wellman original welded rolled steel construction. You get the maximum digging power, and exceptional strength—without excessive weight! Specify Wellman, and you'll specify the best bucket for your purpose.

THE WELLMAN ENGINEERING COMPANY
7003 CENTRAL AVENUE CLEVELAND 4, OHIO

Jahn Opens New Factory

The opening of their new larger factory at Savanna, Ill., was recently announced by C. R. Jahn, President of the C. R. Jahn Co., Chicago, Ill., manufacturers of heavy duty, low-bed trailers. Constructed of steel and concrete and completely fire-proof, the new building was designed exclusively for the production-line method of manufacturing heavy-duty trailers and increases production capacity 300 to 400%. Executive and sales offices will be maintained at their present address in Chicago.

Summers Joins Kotal

Arthur B. Summers, White Plains, N. Y., long associated with the road construction field, has joined the sales force of the Kotal Co., 360 Springfield Ave., Summit, N. J. Mr. Summers was associated with Patterson & Rossi, contractors, for eight years. In 1935 he turned his efforts to sales, contacting road contractors in the states of New York and Connecticut. On July 1, 1942, he resigned his position to lend his services to the war effort, where he managed the sub-contract department of General Electronics Industries, Greenwich, Conn.

New Heil District Manager

Leonard C. Andersen has been appointed district manager of District 8 for The Heil Co., Milwaukee, Wis., covering the states of California, Arizona and Nevada. His headquarters will be at Los Angeles, Calif. This will be the ninth district sales office established by The Heil Co., since the end of the war and, like the others, will supervise sales of all Heil products in its district. Mr. Andersen has been sales coordinator of The Heil Co.'s six divisions for the past four years. He was formerly a district manager at Los Angeles for The Glidden Co. Karl Mindemann, who has been with The Heil Co., for ten years in various supervisory positions, will take over as sales coordinator in Milwaukee. He served as a Lieutenant in the Navy for three years and was manager of the order and scheduling department for the company since his return from service.



L. C. Andersen

Kenyon Joins Andrews Agency

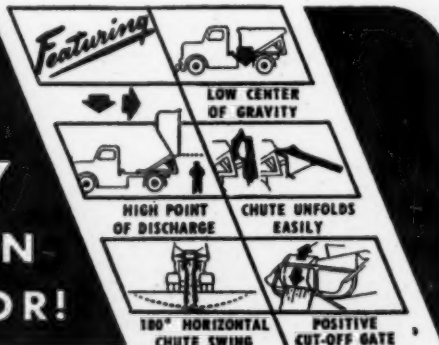
Howard Kenyon, formerly advertising manager of LaPlant-Choate Co., Cedar Rapids, Ia., joined the Andrews Agency of Milwaukee, Wis. on May 1 as vice-president and account executive. Mr. Kenyon has had 18 years of experience in the marketing of construction and industrial equipment. He is a vice-president of the National Industrial Advertising Association, past president of the Cincinnati Chapter, graduate of University of Michigan with an AB in Journalism and member of Sigma Delta Chi (Honorary Journalistic Fraternity).

Opens Brazil Office

Independent Pneumatic Tool Co., Chicago, Ill., has opened a technical office at Sao Paulo, Brazil. E. R. Wyler, vice-president and director of the company's export division, has announced the appointment of Rueben P. Rudy as manager of the new office. Mr. Rudy has been Thor representative in Brazil the past two years. The new office is the 21st on Thor chain, including 18 domestic branches, and offices in Toronto, Canada, and London, England.

HERE IT IS!

THE LOW COST
CONCRETE
(READY MIX) **BODY**
YOU'VE BEEN
WAITING FOR!



The new lightweight Dumpcrete has all the features you need for hauling air-entrained concrete. Yet there is no expensive mixing machinery. Even though it costs less in every way, the Dumpcrete is hauling a superior concrete. For air-entrained concrete is more uniform...more workable...more durable...can be finished sooner.

Today Dumpcrete users are hauling air-entrained concrete for more than 45 minutes with no segregation or bleeding, and with virtually no change in air content and slump. When concrete pouring is held up, the Dumpcrete goes to work hauling sand, gravel, earth or coal.

If you want to know how Dumpcrete users are hauling more loads per day and saving money on every yard, send the coupon today. There's no obligation.




Please send Dumpcrete information.



Firm _____
Name _____
Street _____
City _____ State _____

IT'S NEW -- Scientifically Designed
Offering These Outstanding Features



LA CROSSE LA CROSSE, WISCONSIN
 HEAVY DUTY

- New Wide Base Rims
- Constant Rise "S" Cams
- Nickel Cast Iron Brake Drums
- 12" x 6" brake with 3/4" bolt-on lining

Dealers in 48 States

Nichols Appointed Asst. Sales Manager

Robert P. Nichols has been appointed assistant domestic sales manager for R. G. LeTourneau, Inc., Peoria, Ill. Coming to LeTourneau after serving overseas as a maintenance officer in the Navy, Nichols became a field engineer in the Installation Department, and more recently moved to the Export Division as sales supervisor. An engineer graduate of Purdue University, he has also been associated with Caterpillar Tractor Co. as a special representative in Central and South America. In his new capacity, Nichols will assist S. D. Means, the company's domestic sales manager.



R. P. Nichols

a group of company executives and local investors have acquired control of the parent company and subsidiary, American Steel Supply Corp. The deal was completed and transfer of interest occurred on April 1. Mr. Walb continues as president of the American Steel Dredge Company Inc. and will in addition become chairman of the Board of Directors, an office vacated by Mrs. Cutshall. Dean F. Cutshall has resigned as vice president of the company. Oscar G. Schmieman becomes vice president and sales manager of dredges, hulls and fabrication. The other officers are Glen Birt, vice president and plant manager, Otto C. Scheiman, treasurer, and Don L. Douglas, secretary and sales manager of the Wayne Crane Division. The operations of the company will continue on much the same basis as in the past and there will be no other changes in personnel.

Dumpcrete Distributors

The Dumperete Division of Maxon Construction Co., Dayton, O., has announced the appointment of the following distributors for the specially designed truck body for hauling air-entrained concrete without agitation: Stockberger-Seastrom Co., Ft. Wayne and Indianapolis, state of Indiana;

W. W. Williams Co., Columbus and Independence, state of Ohio; Boehck Equipment Co., Milwaukee, state of Wisconsin and upper Peninsula of Michigan; Boehck Engineering Co., Houston, Tex., 1/2 of Texas; Standard Machinery Co. of San Francisco, northern California; Garlinghouse Brothers, Los Angeles, southern California; McIlhenny Equipment Co. of Roanoke, state of Virginia; Southern Equipment Sales Co. of Columbia, S. C., state of South Carolina; Lee Henry of Huntington, W. Va., state of West Virginia; Hedge-Mattheis Co. of Boston, states of Massachusetts, Rhode Island, Connecticut, New Hampshire, Maine and Vermont; D. C. Elphinstone, Inc., of Baltimore, Md., state of Maryland, Delaware, and District of Columbia.

New Pioneer Distributors

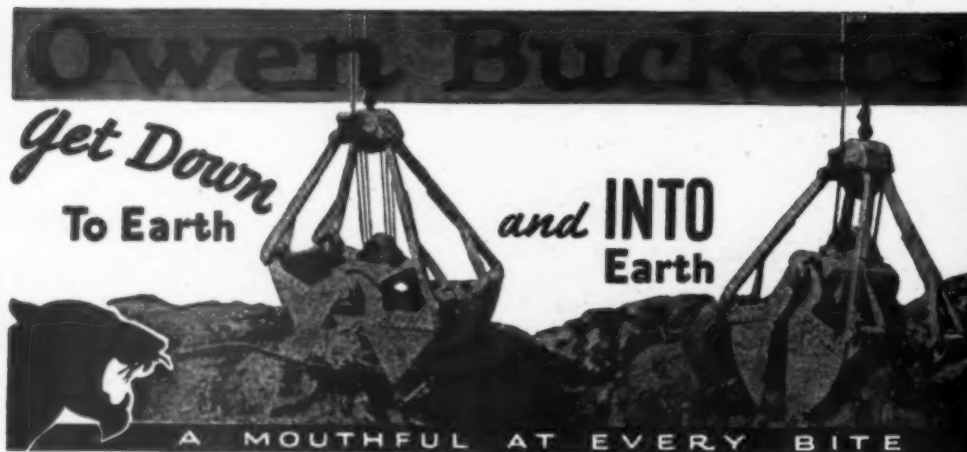
Pioneer Engineering Works, Inc., Minneapolis, Minn., has announced the appointment of two new distributors in Montana. Central Machinery Co., Great Falls, will serve the northwestern part of the state and Wortham Machinery Co., Billings, the southwestern area. Central Machinery Co. and Wortham Machinery Co. will give concentrated coverage to the territory formerly served by Connelly Machinery Co. of Billings.

Walb Interests Buy Control

Through a purchase of the holdings of Mrs. F. H. Cutshall and Dean F. Cutshall in the American Steel Dredge Co. Inc., Ft. Wayne, Ind., and subsidiary, Walter W. Walb and

Owen Buckets

Get Down To Earth and **INTO Earth**



A MOUTHFUL AT EVERY BITE

Owen Buckets can be dropped with entire weight on teeth points or cutting edges. Hard surface penetration is assured with an unusual amount of material between jaws before closing power is applied.

Closing power is efficiently transformed into digging power and proper shell curvatures permit easy sliding entrance and spilling of material.

THE OWEN BUCKET COMPANY
 6020 BREAKWATER AVE. • CLEVELAND, OHIO
 BRANCHES: New York, Philadelphia, Chicago, Berkeley, Calif.

T. R. Johnson Promoted

T. R. Johnson has been appointed general manager of Keystone Asphalt Products Division of American-Marietta Co., Chicago. He will continue to direct Keystone sales activities along with his new duties. He has been sales manager for the Keystone operation since its inception in 1941, and succeeds T. C. Ford, who retired on March 1. Well-known in the pre-formed asphalt products industry for nearly 20 years, Johnson will make his headquarters at the Chicago executive offices of American-Marietta. Lib Panichi has been promoted to the position of production manager at Keystone's plant at Chicago Heights, Ill. Mr. Panichi, recently discharged as a lieutenant colonel after four years' service with the Army engineers, will make his headquarters at Chicago Heights.



T. R. Johnson

New FWD Advertising Manager

Consolidation of the FWD Sales Promotion Department and Advertising Department under managership of M. O. Stockland, Jr., has been announced by The Four Wheel Drive Auto Co., Clintonville, Wis. Mr. Stockland has served as sales promotion manager since the organization of that department early in 1946. The consolidation move came as a result of the retirement of Francis M. Higgins as advertising manager in order that he might devote all of his time to his work as president of the Wisconsin Central Airlines. Mr. Stockland has been connected with The Four Wheel Drive Auto Co. since 1922 and has been located at the home office in Clintonville since 1936.

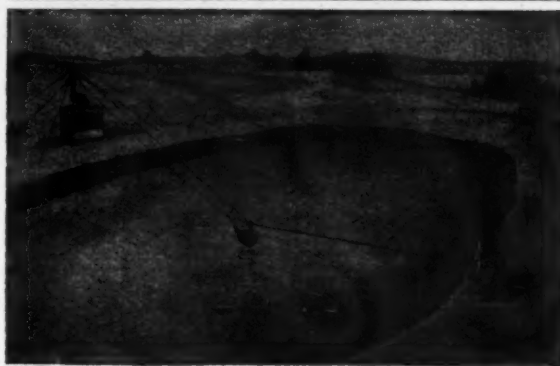


M. O. Stockland, Jr.

Gay Made Sales Engineer

Jack C. Gay has been appointed sales engineer for Hercules Steel Products Co., Galion, O, while Vernon R. Teasley has been named West Coast representative. Mr. Gay will handle sales and distributor problems

YOU TOO CAN CUT COSTS with SAUERMAN LONG RANGE MACHINES



Sauerman Slackline Cableway swings in semi-circle to dig large pit and move gravel to plant.

Suggestions on Material Handling . .

In considering how to simplify your material handling problems, remember that with Sauerman equipment you can dig, lift, haul and dump automatically in one operation with only one-man required at the controls.

Sauerman Machines are made in a number of types—all much alike in general principles but each with special qualifications for a particular class of work. Slackline Cableways, as illustrated above, are most efficient for digging deep under water and conveying to a high delivery point. Power Scrapers are low cost machines for moving materials from pits, banks or stockpiles and delivering to trucks, cars, ground hoppers or storage piles. Tower Excavators are mobile units for large scale earthwork. Tautline Cableways are designed for straight aerial conveying. All are great labor savers, give long service, cost little to maintain. Write for Catalog.

SAUERMAN BROS., INC.

588 S. CLINTON ST.

CHICAGO 7, ILLINOIS



FASTER LOADING, LIFTING, SCRAPING

"The Ottawa" Industrial Hydraulic Front End Loader saves hundreds of man hours on every job. A rugged heavy duty attachment for industrial type tractors that loads bulk materials, does light bulldozing jobs and operates as a portable crane. A year 'round labor saver—will do hundreds of odd jobs better faster. Handles loads up to 4,000 pounds, lifts to a height of 9½ feet. It is shipped complete with super-powered Hydraulic system. Bulldozer, Boom and Snow Plow attachment available to give you maximum productive use of your industrial tractor. Hundreds now in use by contractors, quarries, building material and coal dealers and municipalities. Write today for prices and illustrated bulletin. Immediate shipment. Fits most models industrial tractors.



OTTAWA STEEL PRODUCTS, INC.
OTTAWA, KANSAS

in territory east of the Mississippi. Mr. Gay's experience covers 20 years in the manufacture of hydraulic hoist and dump body equipment. For the past three years he has been in charge of sales engineering and sales organization with The Marion Metal Products Co., Marion, O. Prior to that he was for 17 years in charge of engineering for The Galion Allsteel Body Co., Galion, O. Mr. Teasley has had 20 years of experience in the truck equipment field, serving most recently as a distributor in Twin Falls, Idaho.

J. S. Sawyer Dies

Joshua S. Sawyer, Manager of the Asphalt Department of the Shell Oil Co. at 50 West Fiftieth St., New York, and a director and vice president of The Asphalt Institute, passed away on



J. S. Sawyer

April 6 after a three months' hospitalization. Born in Colorado, educated at Colorado School of Mines, Mr. Sawyer engaged first in railroad and mining and then in highway construction work, the latter as a division engineer with the Oregon State Highway Department. He left this highway construction work to form an asphalt department for Shell Oil on the Pacific Coast, and then came east in 1932 to accomplish a similar organization job for Shell in New York. He was manager of this asphalt department at the time of his death.

"Caterpillar" Personnel Changes

C. A. Barabe, Assistant Eastern Division Sales Manager of Caterpillar Tractor Co. since June, 1945, will start a 6-month medical leave of absence June 15, and W. M. Foster, divisional district representative, has been promoted to the assistant managership. Mr. Barabe, a member of the "Caterpillar" organization since 1937, served in the U. S. Army during World War II in the North African, Sicilian and Italian campaigns and was severely wounded during the bitter fighting on Anzio beach head in Italy. He returned to "Caterpillar" in 1944 as Lieutenant Colonel, retired, and resumed his pre-war duties as special earthmoving consultant before his promotion to the position he is now vacating. Mr. Foster, whose promotion is effective

Two-Cylinder

The NEW ONAN

AIR-COOLED

10 H.P. 4 CYCLE

"CK" ENGINE



A new, light, compact, easily-installed engine of wide power range. Completely "De Luxe" equipped, easy-to-get-at controls, and many other *plus* points. Prompt delivery on early orders.

ONAN ELECTRIC PLANTS—A.C.—350 to 35,000 watts in standard voltages and frequencies; D.C.—600 to 10,000 watts, 115 and 230 volts. Battery chargers—500 to 6,000 watts, 6, 12, 24, 32 and 115 volts.

ONAN AIR-COOLED ENGINES—CK: 2-cylinder opposed, 10 h.p.; BH: 2-cylinder opposed, 5.5 h.p.; 1B: 1-cylinder, 2.5 h.p.



WRITE FOR SPECIFICATIONS

- **HEAVY-DUTY CONSTRUCTION:** Short, sturdy crankshaft. Extra-large bearings.
- **SMOOTH POWER:** Opposed 2-cylinder design. Fully counter-balanced crankshaft.
- **SUPER COOLING:** Axial-flow fan delivers 600 cu. ft. of cool air per minute. Larger fin area.
- **ALUMINUM CONSTRUCTION:** High-strength aluminum castings reduce weight.
- **ELECTRIC STARTING AVAILABLE:** Built-in electric push-button or automatic starting.
- **COMPACT, LIGHT WEIGHT:** Fits into 15 x 19 x 18 inch space. Weighs only 97 pounds.

D. W. ONAN & SONS INC.
2819 Royalston Ave. Minneapolis 5, Minn.

ONAN 4 Cycle ENGINES

Shunk

Snow Plow and Ice Removal BLADES



Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS

Various widths, lengths, thicknesses—flat or curved—standard or special—punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE

Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.





Shunk

MANUFACTURING COMPANY

ESTABLISHED 1854
BUCYRUS, OHIO.

RAPID!



Cuts concrete and cuts labor costs to 2 1/2c per square yard. Applicable to floor work and different types of inside horizontal work.

Very efficient in maintenance work of highways.

Boom folds down and readily trailed by any light truck. Make your compressor treble its output by hooking it to this machine.

Rapid Pavement Breaker Co.

1517 Santa Fe Ave.
Los Angeles 21, Calif.

CONTRACTORS RUBBER PRODUCTS

available from Stock
for immediate Delivery

CONVEYOR, ELEVATOR and
TRANSMISSION BELTING
all widths and piles

V-BELTS all sizes

HOSE

all sizes and types

AIR	DISCHARGE	STEAM
FUEL	COMPRESSOR	VACUUM
FIRE	PILE DRIVERS	SUCTION
WATER	ROAD BUILDERS	WELDING

BOOTS, DREDGE SLEEVES,
PUMP DIAPHRAGMS, ETC.

... and everything rubber
for Industrial Requirements

Write for new catalog

PHONE WRITE WIRE

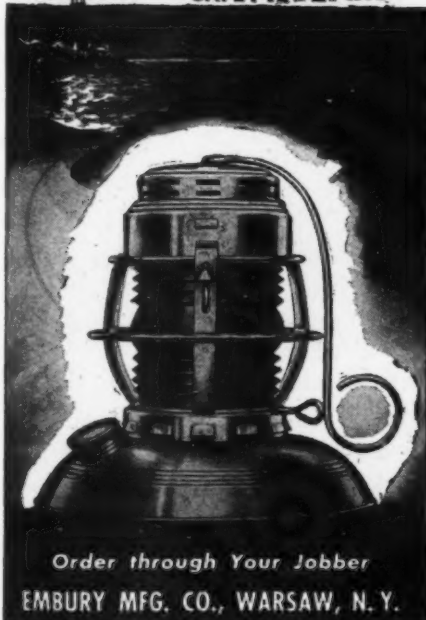
**CARLYLE RUBBER
CO., Inc.**

62-66 PARK PLACE NEW YORK 7, N. Y.
Phone BR 4147 7 9793

The Lighthouse
of the Highway
EMBURY

Traffic Gard

The Warning Lantern
with the **SAFETY BEAM**



Order through Your Jobber

EMBURY MFG. CO., WARSAW, N. Y.

immediately, was graduated from the University of Illinois in 1934 with a degree in Mechanical Engineering. He joined "Caterpillar" the same year, taking a 2-year engineering apprentice course and a 5-month



W. N. Foster



C. A. Barabe

sales training course and also served in the Engine Sales, Merchandise and Purchasing Departments before becoming a district representative in 1944, serving the states of Indiana and Kentucky and a part of Ohio.

Holcomb New P&H Sales Manager

Ralph D. Holcomb has been appointed general sales manager for Harnischfeger Corporation, Milwaukee, Wis. He will direct the sales of all P&H products, excavators, road machinery, hoists, cranes and welding equipment. Mr. Holcomb's promotion follows 18 years of continuous service with the P&H organization. During this period, he has directed sales in many sections of the country, including Wisconsin, New York, Pennsylvania, Missouri, Tennessee, and, finally, California, his latest position being that of district manager for the San Francisco territory. In addition to his long experience in field activities, he also served as sales manager of P&H's Large Excavator Division from 1940 until 1942.



R. D. Holcomb

Green Appointed Sales Representative

Glenn W. Green has been appointed Chicago sales representative for the Columbia Chemical Division of Pittsburgh Plate Glass Co. Prior to the war, Mr. Green was laboratory superintendent for the Duquesne Light Co. at Pittsburgh. A specialist in water treatment and sewage purification, he was assigned by the U.S. Army as superintendent of the Camp Detrick, Md., water plant during two war years.

SYNTRON

100%

Self-Contained



Gasoline Hammer

PAVING BREAKERS



Can
Save
You
Money
and
Time

BUSTING Concrete
CUTTING Asphalt
DIGGING Shale, Clay
TAMPING Backfill



Investigate their advantages

Write for illustrated folder

SYNTRON CO.

384 Lexington, Homer City, Pa.



$\frac{1}{2}$
Cu. Yd.

8
Lift

FRONT END LOADERS for Industrial Tractors

Write for Catalog

Elkhart

White Mfg. Co.

Indiana

Try a Pierce-Bear on that tough job!

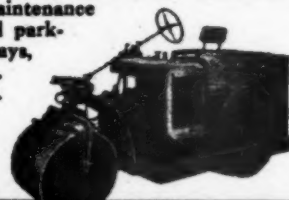


3½ TON — VARIABLE WEIGHTS

Engineered refinements and rugged strength have earned for these rollers enviable performance records. Compact design gives efficient operation in close quarters. Ideal for maintenance work on highways, airports and parking areas. Fine for driveways, docks, etc. Easy to operate. They do a good job at low cost.

Write for New Illustrated Folder.

MANUFACTURED BY



Lewis Manufacturing Co.

SAN ANTONIO 6, TEXAS

P. O. BOX
500

International Harvester Changes


International Harvester Co., Chicago, Ill., has announced the following changes in branch management: W. F. Schaeffer, formerly retail motor truck manager at Shreveport, La., has been appointed assistant manager at that branch. M. R. McClure, formerly sales promotion man at Fort Dodge, Ia., has been appointed assistant manager at that branch. H. T. Rosell, formerly retail motor truck manager at Wichita, Kan., has

been appointed assistant manager at the Dallas motor truck branch. R. G. Walls, formerly retail motor truck manager at Atlanta, Ga., has been appointed assistant manager at the New Orleans motor truck branch. G. B. Healey, formerly retail manager at Eau Claire, Wis., has been appointed assistant manager at the Davenport motor truck branch. J. D. Richardson, formerly assistant manager at Omaha, Neb., has been appointed manager of the newly established Omaha motor truck branch.

Lima Gets Safety Award

Lima Locomotive Works, Inc., Lima, O., was recently awarded a certificate of merit by the Industrial Commission of Ohio, Division of Safety and Hygiene, for having the best safety record of the heavy industries division for 1946. The award was presented by James H. Fulker, Superintendent of the Division of Safety and Hygiene, at the 16th annual Allen County Safety Award Dinner. William J. Rogers, Director of the State Department of Public Relations, was the principal speaker.


In
CLEVELAND
IT'S THE
HOLLENDEN



1000 ROOMS WITH BATH
RADIO IN EVERY ROOM
SIX FINE RESTAURANTS
CENTRAL DOWNTOWN LOCATION
GARAGE ATTACHED

JAMES J. FITZPATRICK
GENERAL MANAGER

ETNYRE
"Black-Topper"
BITUMINOUS DISTRIBUTORS



ACCURATE . . . DEPENDABLE . . . ECONOMICAL—
Over 40 years of constant research, faithful attention to engineering detail, quality construction methods and materials—all assure you of accurate distribution, dependable performance and economical operation with an Etnyre "Black-Topper". See your Etnyre dealer or write direct.

E. D. ETNYRE & CO., Oregon, Illinois

PONDEROUS EQUIPMENT



ROGERS BROTHERS CORPORATION

110 ORCHARD ST. ALBION, PA.

on ROGERS HEAVY DUTY TRAILERS

Services Dealers by Plane

The Frank G. Hough Co., Libertyville, Ill., manufacturer of tractor shovels and sweepers, has acquired a Stinson Voyager 150 5-passenger airplane to assist its sales department in servicing its dealers throughout the country. C. E. Killebrew, sales manager, pilots the ship himself, having logged many hours in the air. Mr. Killebrew has found the plane invaluable in the coverage of conventions, dealer meetings and sales and service schools which happen to be running concurrently and hundreds of miles apart.

New Richkraft Distributors

The Richkraft Co., Chicago, Ill., has announced the appointment of four new distributors. They are the T. H. Rogers Lumber Co., 21 West Cherokee, P.O. Box 65, McAlester, Okla.; General Sash & Door Co., P. O. Box 2707, Tulsa, Okla.; Walling Sash & Door Co., P.O. Box 1380, Wichita, Kans.; and Stark & Co., 900 East 18th St., Kansas City 8, Mo. The complete line of Richkraft building and construction products will be handled by these companies.

Wallis Made Eastern Sales Manager

The J. D. Adams Manufacturing Co., Indianapolis, Ind. has announced the appointment of Buel Wallis as Eastern Division sales manager. All sales east of the Mississippi will come under



Buel Wallis

Mr. Wallis' jurisdiction as well as federal sales. Mr. Wallis joined the Adams organization in June, 1929 and served as office or branch manager of the Adams direct factory branches in Dallas, St. Louis, Memphis, Atlanta and Des Moines. In June, 1942 he was appointed Washington representative for the Adams organization and became assistant eastern division manager when the Washington office was closed in October, 1945.

New Davey Distributors

Davey Compressor Co., Kent, O., has appointed the following distributors: Berry Bros. Machinery & Re-

pair Works, 378 South Industrial Blvd., Dallas, Tex. for northeastern Texas, adjoining Oklahoma; Midwest Engine & Equipment Co., Inc., 105 North Boulder, Tulsa, Okla., for Oklahoma; Knox-Tenn. Equipment Co., Knoxville, Tenn. for eastern Tennessee; and Inland Diesel & Machinery Co., Spokane, Wash., for territory in Washington, east of and including counties of Okanogan, Chelan, Kittitas, Yakima, Klickitat; Idaho north of counties of Valley and Adams, and Northwestern Montana.

Mack Appoints

Appointment of managers for two of the most important of Mack-International Motor Truck Corporation's 67 direct factory branches has been announced by A. C. Fetzer, Vice President. John A. Sloan, formerly district manager of the Des Moines, Ia., Branch, will now serve in the same capacity at Mack's Chicago Branch, 33rd St. and Wentworth Ave. A. L. Monck, formerly of Mack's St. Louis Branch, has been named district manager in charge of the company's Des Moines Branch, succeeding Mr. Sloan. Des Moines headquarters are located at 106 East Grant Ave.



Heavy-duty trailers from 5 to 100 tons

SAFE FOR THE BIGGEST LOADS

HAULING CONTRACTORS everywhere depend on Jahn Heavy-Duty Trailers for safe, fast and economical moving of their heaviest loads like this 110,000-lb. transformer. Deep, wide flange main beams run the full length of the trailer. Cross-members and outriggers are I-Beam sections. Improved, fabricated gooseneck adds greater built-in strength. Positive, self-equalized braking at each wheel regardless of position of axle assures maximum safety. See your nearest Jahn dealer for details.

C. R. JAHN COMPANY

1345 WEST 37th PLACE, CHICAGO 9, ILL.



Reg. Trade-Mark

CLEARING HOUSE

Help Wanted

WANTED AT ONCE

30 Civil Engineers All Grades

For Highway Location, Design
and Construction

With or Without Experience

Permanent Positions as
Instrumentmen, Inspectors,
Project Engineers, Resident
Engineers

Opportunity for location in west-
ern state that has excellent pros-
pects for rapid development.

Give age, experience, education.

M. P. WYNKOOP
Chief Engineer
State Highway Department
Bismarck, North Dakota

For Sale

FOR SALE OR RENT

LeTourneau Scrapers—all sizes.
LeTourneau Double Drum Sheepfoot
Roller.

Air Compressors, 60—105—210.

Air Tools—all kinds.

Link Belt YC9 Cargo Crane.

5- to 8-ton Tandem Rollers.

8- to 12-ton Tandem Rollers.

LeTourneau D4 Tournapulls.

Wiley Model F Stiffleg Derrick.

Electric Sets—1½ KW—5 KW—10 KW.

Centrifugal Pumps, 1½"—2"—3".

J. W. Stang Well Point System.

WATKINS ALDRIDGE EQUIPMENT CO.
JACKSON, MISS.

CATERPILLAR REPAIR PARTS

New, diversified assortments, all
boxed and each part identified with
factory number; several separate
lots available; these lots range
from \$2,000.00 to \$8,000.00 each.
Parts are priced at approximately
50% discount. Immediate shipment
from Louisville stock. Sold only by
lots.

W. W. RENTAL EQUIPMENT CO.

1212 Kentucky Home Life Bldg.
Phone Jackson 2674
Louisville 2, Kentucky

For Sale

FOR SALE

- 1—Iroquois Asphalt Plant
with 3000# box (shows
no wear)\$14,000.00
- 1—Huber 10-ton, 3-wheel
roller, gas 900.00
- 1—Kelly-Springfield 5-ton,
3-wheel roller with
scarifier 900.00
- 2—Bull Clam Drotts
(new) both for 700.00
- 1—Galion 10-ton, 3-wheel
roller with 24" wheels 4,000.00
- 5—Galion tandem rollers
(various weights and
prices).
- 1—P & H Crane, Model
200, Serial #1865.... 3,500.00
- 1—P & H Crane, Model
450, Serial #4116X... 6,000.00
- 3—Kelly-Springfield steam
rollers, two 8-ton, one
10-ton (various prices.)

PHIL H. MCGUIRE

P. O. Box 6055, Milan Station,
Norfolk 8, Va.

TANKS — PILING, ETC.

- 25—10,000 gal. Car Tanks with Colla.
- 75—4200 gal. cap. Vert. Steel Tanks.
- 200 Tons Carnegie 27-lb., 40-ft. Piling.
- 2—1,000 ft. Chg. Pneu. Diesel Compressors.

R. C. STANHOPE, INC.

60 East 42nd Street New York 17, N. Y.

FOR SALE

One 1946 Super C Tournapull. Has been
used 350 hr. One new LeTourneau D8
Power Control Unit. Priced right. Lo-
cated near Ocheyedan, Iowa.

GUS OSTERMANN & SONS
OCHEYEDAN, IOWA

FOR SALE

- 2—Model HC250H Sterling Dump
Trucks, Cummins Diesel En-
gines, Penn 12 C. Y. Rock Bod-
ies, Penn Hoists.
- 3—Model F. K. Mack Dump Trucks,
Cummins Diesel Engines, Penn
12 C. Y. Rock Bodies, St. Paul
Hoists.
- 2—Model CJ Mack Dump Trucks,
Mack Gas Engines, Penn 8 C. Y.
Rock Bodies, Heil Hoists.

**THE S. T. BROTEMARKE CONSTRUCTION
COMPANY**

P. O. Box 393 Cumberland, Maryland

For Sale

30—10,000 GAL. CAP. R. R.
TANK CAR TANKS.
CLEANED, TESTED, PAINTED.
READY TO SHIP. ATTRACT-
IVE PRICES. DEALERS PRO-
TECTED.

Telephone Bryn Mawr 1769

L. M. Stanhope

ROSEMONT

PENNA.

EQUIPMENT FOR SALE

- 1—Rex 34-E dual drum paver Se-
rial No. GG 153.
- 1—Blaw-Knox concrete finishing
machine. Serial No. XB-2087.
- 1—Jaeger concrete finishing ma-
chine. Serial No. 42-X-087.
- 1—Buckeye power driven fine grad-
er. Serial No. 319.
- 1—Lorain 40-D crane and dragline.
Serial No. 10798.
- 1—International T.D. 14 tractor
and bulldozer. Serial No. TDF-
675.
- 1—Trail grader—Cleveland. Serial
No. 4176.

All of the above in excellent
condition.

IVY H. SMITH CO.

JACKSONVILLE, FLA.

P. O. Box 5098

Ph. 9-4458

For Sale

Slightly used Cleaver-Brooks #2
Heavy Duty Pumping Booster,
equipped with 4 cylinder Model
XAH 3½"x4½" Waukesha Engine,
electric starter, battery, electric im-
pulse gasoline pump, 4 speeds for-
ward and one reverse truck trans-
mission, connected with double
width chain drive to 3½"x3" special
reversible Kinney jacketed asphalt
pump; all mounted on channel iron
frame for mounting on any truck
or trailer. Is now mounted on 1937
Ford truck in good condition; may
be purchased with truck if desired.
Location, Bridgeton, Cumberland
County, New Jersey.

GEORGE SLADE

Dutch Neck Road, Bridgeton, N. J.
Phone Bridgeton 1066

Appointed Merchandising Manager

The Truckstell Co., Cleveland, O., distributors of special truck equipment, has announced appointment of W. F. (Wally) Balzerick as merchandising manager. During the last two years he has served as Western divisional manager. Mr. Balzerick is widely known in the truck and passenger car business, having spent 15 years with the Chevrolet Motor Division of General Motors Corp. and Dodge Division of Chrysler Corp. as regional merchandising manager and zone truck manager. During the war he served with the War Department in Washington, D. C., as head administrative officer in the office of the Chief Signal Officer, where he handled many special assignments.

Miller Appointed District Manager

Robert L. Miller, formerly assistant sales manager of the Road Machinery Division of The Heil Co., Milwaukee, Wis., has been appointed district sales manager for all Heil products in the central states of Iowa, Missouri, Nebraska, Kansas, and Colorado, with headquarters at Kansas City. Miller has been with the Road Machinery Division of the company since its inception about 12 years ago. He served first as sales correspondent, and during the war was in charge of road machinery production. At war's end, he was made a district sales representative and later, assistant sales manager. In his new position, he will take over the management of the Heil District Office at Kansas City, which was established several years ago as one of the nine similar strategically located offices set up to assist distributors of Heil products.



R. L. Miller

Purchases Pennsylvania Crusher Co.

The Bath Iron Works Corp., Bath, Me., has purchased all the outstanding stock of the Pennsylvania Crusher Co. of Philadelphia, Pa. The Pennsylvania Crusher Co. had no plant of its own, having heretofore sub-contracted its production. Beginning as

soon as arrangements can be made, all manufacturing will be concentrated at the Bath plant. Sales and Engineering offices will be continued at Broad and Arch Sts., Philadelphia.

Appointed Salesman for Beckwith

Appointment of George A. Scott as salesman for the Wilkes-Barre office of Beckwith Machinery Co. was recently announced by Fred W. Greenley, new branch manager. He will represent the lines of Beckwith-distributed equipment for the construction and



George A. Scott



Fred W. Greenley

road building industries in Clinton, Lycoming, Sullivan, Montour, Columbia, Northumberland counties and the lower section of Luzerne County. Mr. Scott was recently added to the sales staff after appointment of Fred W. Greenley to branch manager which followed promotion of previous manager, Hugh A. Cameron, to the post of general sales manager of the entire Beckwith organization.

Appointed Director of Purchases

W. T. Stratton has been appointed director of purchases of the Wickwire Spencer Steel Division of the Colorado Fuel and Iron Corporation, and will be located at the Curtiss Building, 361 Delaware Avenue, Buffalo 2, New York. He will replace E. A. Johnston, who has resigned. Mr. Stratton brings to his new association a total of 28 years in purchasing and traffic departments of the steel industry.

New General Sales Manager

George W. Marshall, Jr., has been appointed general sales manager, Asbestos Products Division of Raybestos-Manhattan, Inc. In his new position, Mr. Marshall will continue as general manager of the Asbestos Textile and Packing Division and in addition will direct the sales activities of the Corporation's Equipment Sales Division, and will make his headquarters at the Corporation's Chicago offices, 445 Lake Shore Drive.

Reliance

CRUSHING, SCREENING and WASHING UNITS

● Up to 2000 Tons a Day ●

Crushers	Bins	Drag-Lines
Elevators	Pulverizers	"GAYCO"
Sweepers	Feeders	Centrifugal
Screeners	Spreaders	Air Separators
Wash Boxes	Kettles	
	Conveyors	

UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.

Canadian Representatives: F. H. Hopkins & Co., Ltd.
140 Canada Cement Co., Montreal, Que., Can.

ARIENS

FOR SECONDARY ROAD CONSTRUCTION

AGGMIXER



Here's equipment designed especially for

The swirling, chopping action of these machines does a thorough job of mixing, wet or dry.

mixed-in-place construction — to operate in connection with other general purpose equipment. Wherever aggregates are used it thoroughly pulverizes, mixes and carries aggregates with blades — rapidly and economically. Also ideal for soil cement stabilization. Safe and easy to operate — adjustable to any tractor — made 4 standard sizes, 4', 5', 6' and 7'. Write for details.

ARIENS COMPANY

BRILLION, WIS.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan Illustrated CATALOG today.

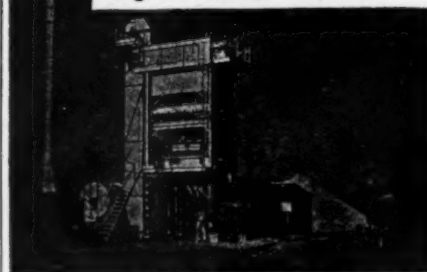


TOOLS — THE WORLD OVER —
NOTED FOR QUALITY AND DURABILITY

VULCAN TOOL MFG. CO.
QUINCY, MASS.

PORTABLE ASPHALT PLANTS

High Production—Low Cost



THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

Inquiry Blank and Advertisers' Index

Check reference to advertisement or to items of equipment or materials on which you wish to receive information. Give your name and address in the space at foot of page (if convenient, please print or use typewriter), detach page and mail to **ROADS AND STREETS, Readers' Service Department, 22 West Maple Street, Chicago 10, Ill.** We will pass your inquiry along to manufacturers and see that you get desired information promptly.

Check below advertisements on which you wish information on products featured:

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Check other products below on which you wish us to obtain information for you:

- | | | | |
|---|---|---|---|
| AGGREGATE:
<input type="checkbox"/> Bins and Hoppers
<input type="checkbox"/> Conveyors
<input type="checkbox"/> Crushers
<input type="checkbox"/> Portable Plants
<input type="checkbox"/> Screens
BITUMINOUS:
<input type="checkbox"/> Batchers
<input type="checkbox"/> Finishers
<input type="checkbox"/> Distributors
<input type="checkbox"/> Dryers
<input type="checkbox"/> Heaters
<input type="checkbox"/> Plants (central)
<input type="checkbox"/> Plants (travel)
CONCRETE:
<input type="checkbox"/> Batchers
<input type="checkbox"/> Buggies and Carts
<input type="checkbox"/> Finishers
<input type="checkbox"/> Joints, Expansion and Contraction
<input type="checkbox"/> Reinforcement
<input type="checkbox"/> Accessories
<input type="checkbox"/> Metal Road Accessories
<input type="checkbox"/> Mixers (under 1 yd.)
<input type="checkbox"/> Mixers (1 yd. up)
<input type="checkbox"/> Pavers
<input type="checkbox"/> Reinforcing Steel
<input type="checkbox"/> Road Forms (1000' set)
<input type="checkbox"/> Tower
<input type="checkbox"/> Truck Mixers
CRANES:
<input type="checkbox"/> Crawler Mounted | <input type="checkbox"/> Truck Mounted
<input type="checkbox"/> Piledrivers
GRADERS:
<input type="checkbox"/> Blade, self propelled
<input type="checkbox"/> Blade, pull type
<input type="checkbox"/> Blade, under truck
<input type="checkbox"/> Elevating
LOADERS & TRENCHERS:
<input type="checkbox"/> Front-end loader (tractor mounted)
<input type="checkbox"/> Loader, bucket type and belt type
<input type="checkbox"/> Trencher or Ditcher
HAULING EQUIPMENT:
<input type="checkbox"/> Dump Trucks, self-powered
<input type="checkbox"/> Dump Wagons, tractor drawn
<input type="checkbox"/> Flatbed Trailers
<input type="checkbox"/> Other Trucks
PUMPS:
<input type="checkbox"/> Centrifugal
<input type="checkbox"/> Concrete
<input type="checkbox"/> Diaphragm
<input type="checkbox"/> Mud Jacking
<input type="checkbox"/> Piston
<input type="checkbox"/> Wellpoint
POWER UNIT:
<input type="checkbox"/> (Independent)
<input type="checkbox"/> Gasoline | <input type="checkbox"/> Diesel
<input type="checkbox"/> Electric
ROLLERS:
<input type="checkbox"/> Power (Smooth)
<input type="checkbox"/> Pneumatic Tire
<input type="checkbox"/> Sheepfoot
TRACTORS:
<input type="checkbox"/> Crawler
<input type="checkbox"/> Rubber-Tired
TRACTOR EQUIPMENT:
<input type="checkbox"/> Dozers
<input type="checkbox"/> Power Control Units
<input type="checkbox"/> Rippers
<input type="checkbox"/> Scrapers, tractor drawn
<input type="checkbox"/> Scrapers, self-powered
BUCKETS:
<input type="checkbox"/> Clamshell
<input type="checkbox"/> Concrete
<input type="checkbox"/> Dragline
<input type="checkbox"/> Orange Peel
SHOVELS & DRAGLINES:
<input type="checkbox"/> Crawler (under 1 yd.)
<input type="checkbox"/> Crawler (1 yd. up)
<input type="checkbox"/> Truck Mounted
ROCK DRILLS & AIR TOOLS:
<input type="checkbox"/> Air Compressors
<input type="checkbox"/> Backfill Tampers
<input type="checkbox"/> Clay Diggers | <input type="checkbox"/> Concrete Vibrators
<input type="checkbox"/> Drills, cable tool
<input type="checkbox"/> Drills, tripod and wagon
<input type="checkbox"/> Drills, rock, hand-held
<input type="checkbox"/> Paint Sprayers
<input type="checkbox"/> Paving Breakers
<input type="checkbox"/> Riveters and Chippers
MISCELLANEOUS:
<input type="checkbox"/> Buildings, portable
<input type="checkbox"/> Earth Drills, power
<input type="checkbox"/> Light Plants
<input type="checkbox"/> Lubrication, Service Truck
<input type="checkbox"/> Mowers, Highway
<input type="checkbox"/> Power Saws
<input type="checkbox"/> Soil Stabilizing Equipment
<input type="checkbox"/> Snowplows, rotary
<input type="checkbox"/> Snowplows, v or wing
<input type="checkbox"/> Spreaders, sand or cinders
<input type="checkbox"/> Street Flushers
<input type="checkbox"/> Street Sweepers
<input type="checkbox"/> Welders
<input type="checkbox"/> Cutting Torches
<input type="checkbox"/> Hydraulic Jacks
<input type="checkbox"/> Hydraulic Control Equipment
<input type="checkbox"/> Hand Tools
<input type="checkbox"/> Hoists, derrick type |
|---|---|---|---|

Be sure to fill in name and address below:

Title
or profession.

Your Name

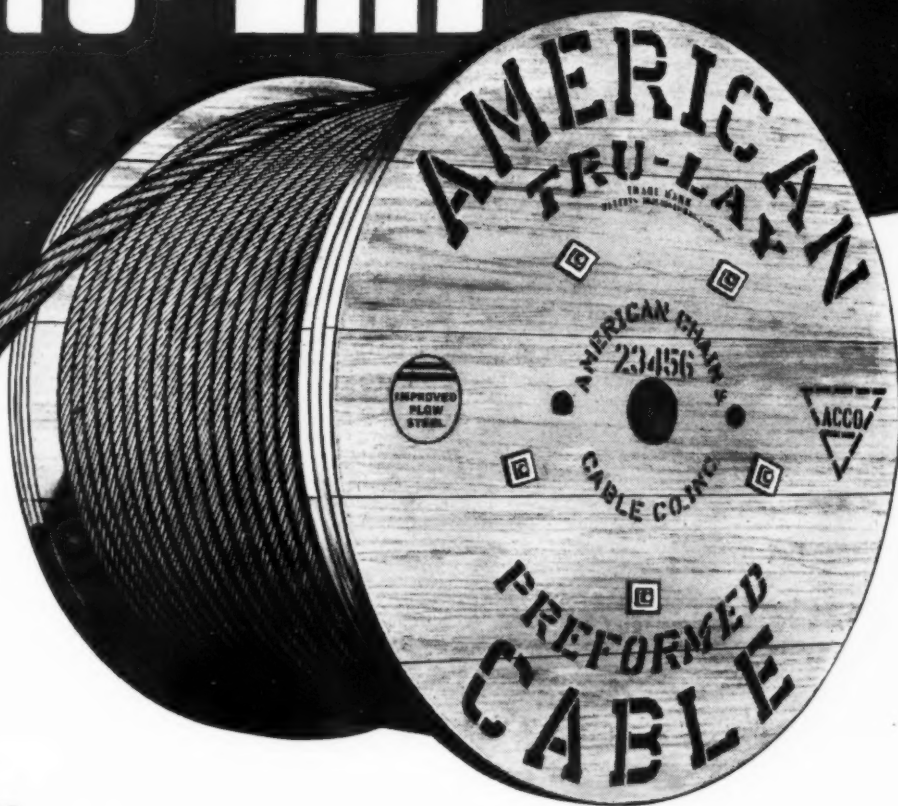
Name of your company or governmental department

Type of work for which equipment will be used

Street Address

City State County

TRU-LAY *Preformed*



for **DRAG LINES**

Because American Cable TRU-LAY is preformed, the wires and strands are free from internal strain. This makes TRU-LAY a limber rope, ready for fast unwinding. It whips less—runs out truer. Your men get better casts. They can make top speed with the load, too, because it is a characteristic of TRU-LAY Preformed to spool smoothly on the drum. Being an extremely flexible line, TRU-LAY Preformed better withstands bending fatigue and so lasts longer, steadies machine production, moves more yards per rope, gives greater dollar value. If you have drag-line work to do, by all means specify TRU-LAY Preformed of Improved Plow Steel.

...rra, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Seattle, Bridgeport, Co



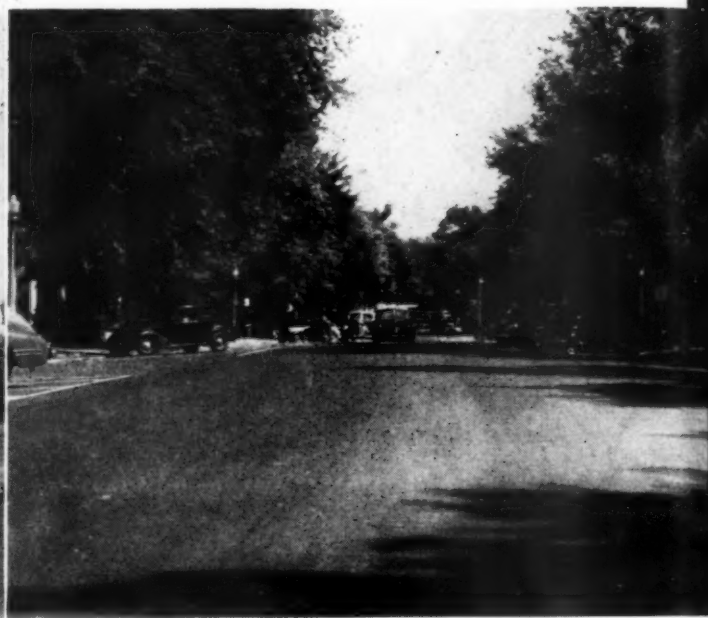
**AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE**

Stepping up civic pride!

by topping 80,000 sq. yds of old streets with Texaco



Constructing a 2-inch Texaco Asphaltic Concrete surface over the old pavement on Broadway in Columbia, Mo.



Completed Texaco Asphaltic Concrete pavement on Broadway, laid by the Flinn Paving Company of Columbia, Mo.

One of the most effective stimulants to civic pride results from transforming a city's old, worn streets into smooth, attractive, easy-riding thoroughfares.

Columbia, Mo., has shown how this highly desirable end can be achieved at moderate cost. Last year, Columbia resurfaced 80,000 square yards of rough, unsightly streets with a two-inch thickness of resilient, heavy-duty Texaco Asphaltic Concrete.

Columbia's new plant-mixed Texaco paving is of the dense graded type, in which either limestone or Joplin chat serve as aggregate and Texaco No. 96 Paving Cement as binder. A tack coat of Texaco Rapid-curing Cutback Asphalt was applied to the old streets prior to laying the pavement.

City Engineer Dewey Welch reports that Columbia's paving "has caused favorable comment by the local people."

Texaco Engineers, who are Asphalt specialists, will be glad to assist you with your street paving or maintenance problem. Write our nearest office.



THE TEXAS COMPANY, Asphalt Sales Dept., 135 E. 42nd Street, New York City 17
 Boston 16 Chicago 4 Denver 1 Houston 1 Jacksonville 2 Philadelphia 2 Richmond 19

TEXACO ASPHALT